AVT Prosilica GE

Technical Manual

AVT GigE Vision Cameras

70-0063
V2.0.0

14 July 2011

Allied Vision Technologies Canada Inc.
101-3750 North Fraser Way
V5J 5E9, Burnaby, BC / Canada

ALLIED Vision Technologies

Legal notice

For customers in the U.S.A.
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However there is no guarantee that interferences will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Use a different line outlet for the receiver.
- Consult a radio or TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart A of Part 15 of FCC Rules.

For customers in Canada
This apparatus complies with the Class A limits for radio noise emissions set out in the Radio Interference Regulations.

Pour utilisateurs au Canada
Cet appareil est conforme aux normes classe A pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

Life support applications
These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Allied Vision Technologies customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Allied for any damages resulting from such improper use or sale.

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Introduction

This **AVT Prosilica GE Technical Manual** describes in depth the technical specifications of this camera family including dimensions**,** feature overview, I/O definition, trigger timing waveforms, frame rate performance, etc.

For information on software installation read the **AVT GigE Installation Manual**.

For detailed information on camera features and controls specific to the Prosilica GX, GE, GS, GB and GC refer to the **AVT Prosilica GigE Camera and Driver Attributes** document.

www

AVT Prosilica GE literature:

http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-ge.html

Info

Please read through this manual carefully.

Document history

Version	Date	Remarks
V2.0.0	14.07.11	New Manual – SERIAL Status

Table 1: Document History

Symbols used in this manual

Note

This symbol highlights important information

Caution

This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.

www

This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:

http://www.alliedvisiontec.com

Warranty

Info

Allied Vision Technologies Canada provides a 2 year warranty which covers the replacement and repair of all AVT parts which are found to be defective in the normal use of this product. AVT will not warranty parts which have been damaged through the obvious misuse of this product.

Precautions

Caution

DO NOT OPEN THE CAMERA. WARRANTY IS VOID IF CAMERA IS OPENED.

This camera contains sensitive components which can be damaged if handled incorrectly.

Caution

KEEP SHIPPING MATERIAL.

Poor packaging of this product can cause damage during shipping.

Caution

VERIFY ALL EXTERNAL CONNECTIONS.

Verify all external connections in terms of voltage levels, power requirements, voltage polarity, and signal integrity prior to powering this device.

Caution

CLEANING.

This product can be damaged by some volatile cleaning agents. Avoid cleaning the image sensor unless absolutely necessary. Please see instructions on sensor cleaning in this document.

Caution

DO NOT EXCEED ENVIRONMENTAL SPECIFICATIONS.

See environmental specifications limits in the Specifications section of this document. Special care is required to maintain a reasonable operating temperature. If the camera is to be operated in a warm environment, it is suggested that the camera be mounted on a heat sink such as a metal bracket and that there is sufficient air flow.

Cleaning the sensor

Caution

DO NOT CONTACT CLEAN SENSOR UNLESS ABSOLUTELY NECESSARY

Identifying Debris

Debris on the image sensor or optical components will appear as a darkened area or smudge on the image that does not move as the camera is moved. Do not confuse this with a pixel defect which will appear as a distinct point.

Locating Debris

Before attempting to clean the image sensor, it is important to first determine that the problem is due to debris on the sensor window. To do this you should be viewing a uniform image, such as a piece of paper, with the camera. Debris will appear as a dark spot or dark region that does not move as the camera is moved. To determine that the debris is not on the camera lens, rotate the lens independent of the camera. If the spot moves as the lens moves, then the object is on the lens -not on the image sensor- and therefore cleaning is not required. If the camera has an IR filter, then rotate the IR filter. If the object moves then the particle is on the IR filter not the sensor. If this is the case remove the IR filter carefully using a small flat head screw driver. Clean both sides of the IR filter using the same techniques as explained below for the sensor window.

Caution

DO NOT TOUCH ANY OPTICS WITH FINGERS. OIL FROM FINGERS CAN DAMAGE FRAGILE OPTICAL COATINGS.

Cleaning with Air

If it is determined that debris is on the sensor window, then remove the camera lens, and blow the sensor window directly with clean compressed air. If canned air is used, do not shake or tilt the can prior to blowing the sensor. View a live image with the camera after blowing. If the debris is still there, repeat this process. Repeat the process a number of times with increased intensity until it is determined that the particulate cannot be dislodged. If this is the case then proceed to the contact cleaning technique.

Contact Cleaning

Only use this method as a last resort. Use 99% laboratory quality isopropyl alcohol and clean cotton swabs. Dampen the swab in the alcohol and gently wipe the sensor in a single stroke. Do not reuse the same swab. Do not wipe the sensor if the sensor and swab are both dry. You must wipe the sensor quickly after immersion in the alcohol, or glue from the swab will contaminate the sensor window. Repeat this process until the debris is gone. If this process fails to remove the debris, then contact AVT.

Conformity

Allied Vision Technologies declares under its sole responsibility that all standard cameras of the **AVT Prosilica GE** family to which this declaration relates are in conformity with the following standard(s) or other normative document(s):

- CE, following the provisions of 2004/108/EG directive
- FCC Part 15 Class A
- RoHS (2002/95/EC)

We declare, under our sole responsibility, that the previously described **AVT Prosilica GE** cameras conform to the directives of the CE.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Specifications

Prosilica	GE680/GE680C
Resolution	640 x 480 pixels
Sensor	Kodak KAI-0340
Type	CCD Progressive
Sensor size	1/3 inch
Cell size	7.4µm
Lens mount	C
Max frame rate at full resolution	205 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	25 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 4.5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	169g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.2µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 2: Prosilica GE680 camera specification

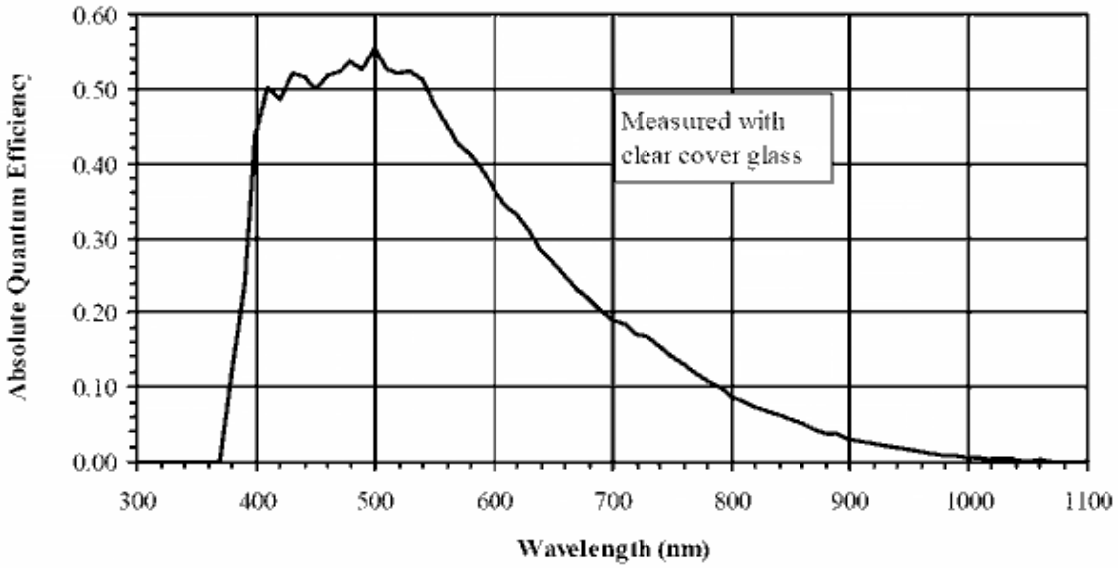


Figure 1 – Prosilica GE680 monochrome spectral response

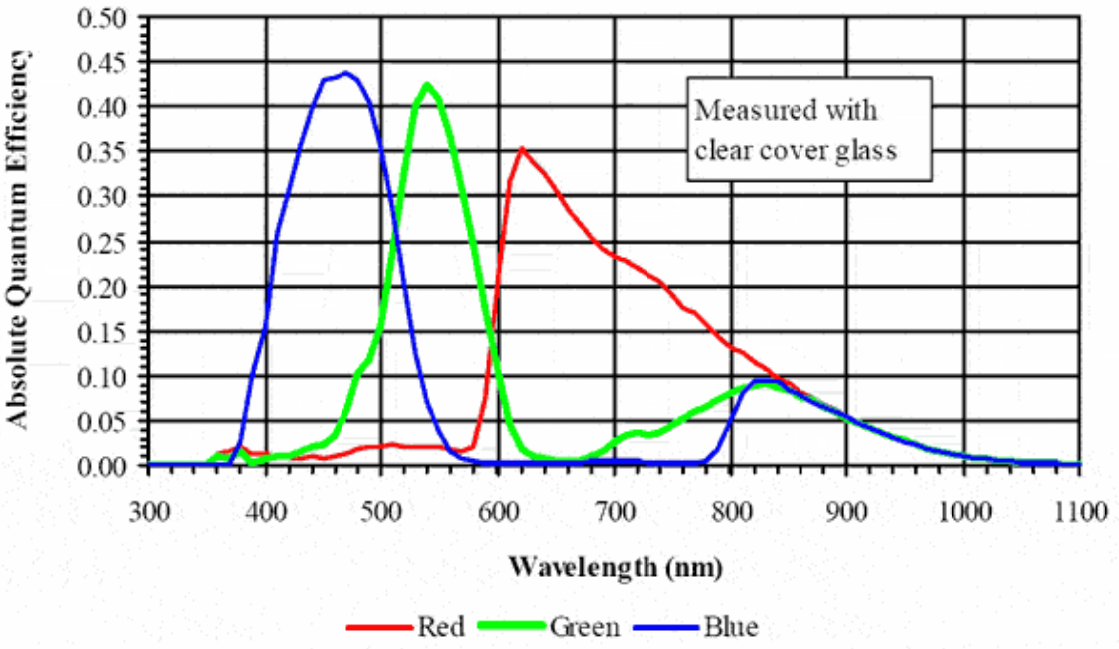


Figure 2 – Prosilica GE680C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE1050/GE1050C
Resolution	1024 x 1024 pixels
Sensor	Kodak KAI-01050
Type	CCD Progressive
Sensor size	1/2 inch
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	59 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	178g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	5µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 3: Prosilica GE1050 camera specification

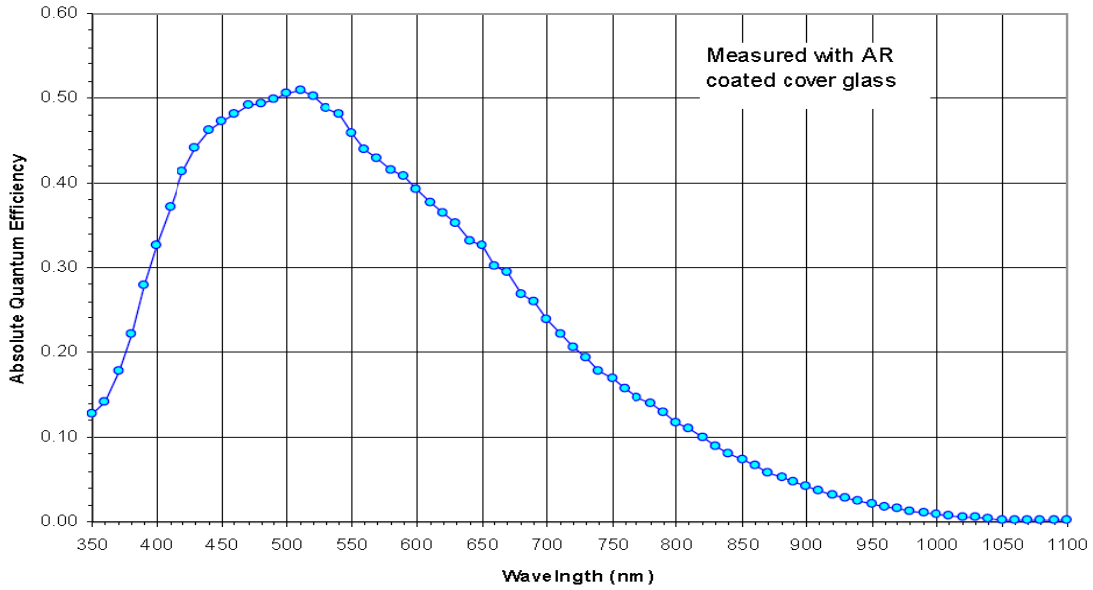


Figure 3 – Prosilica GE1050 monochrome spectral response

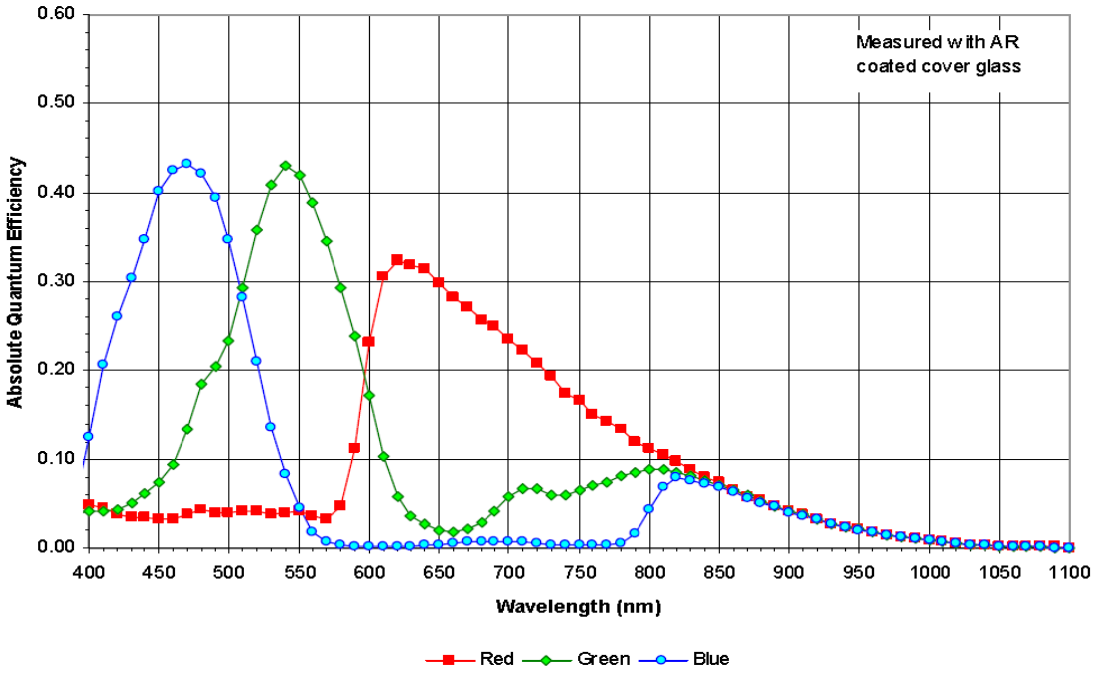


Figure 4 – Prosilica GE1050C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE1650/GE1650C
Resolution	1600 x 1200 pixels
Sensor	Kodak KAI-2020
Type	CCD Progressive
Sensor size	1 inch
Cell size	7.4µm
Lens mount	C
Max frame rate at full resolution	32 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	50 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	169g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	5µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 4: Prosilica GE1650 camera specification

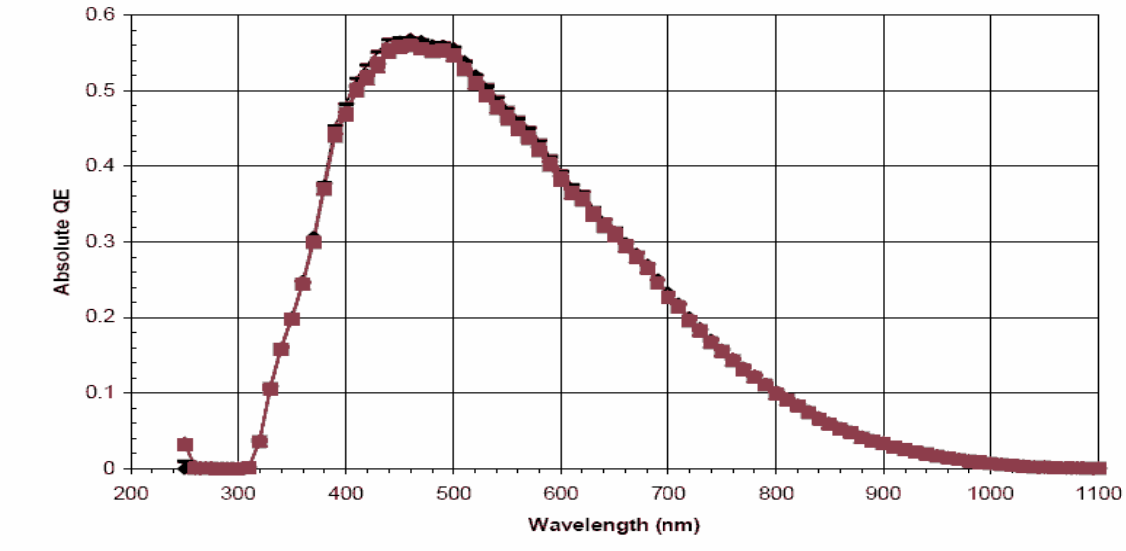


Figure 5 – Prosilica GE1650 monochrome spectral response

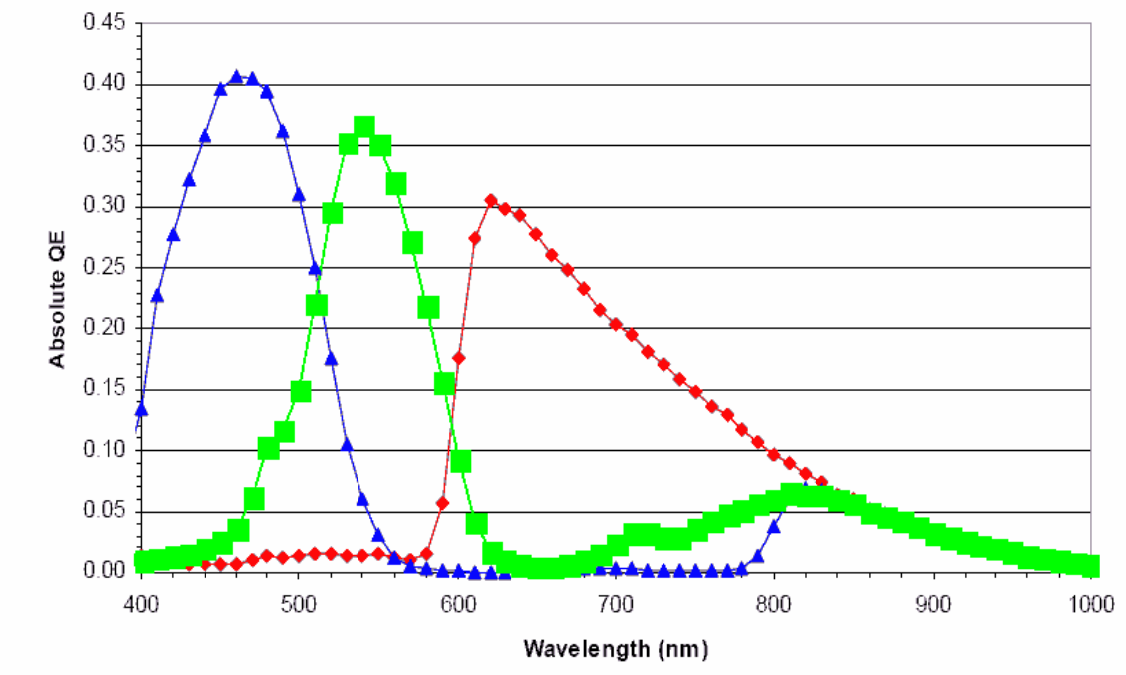


Figure 6 – Prosilica GE1650C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE1660/GE1660C
Resolution	1600 x 1200 pixels
Sensor	Kodak KAI-02050
Type	CCD Progressive
Sensor size	2/3 inch
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	34.6 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	178g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	5µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 5: Prosilica GE1660 camera specification

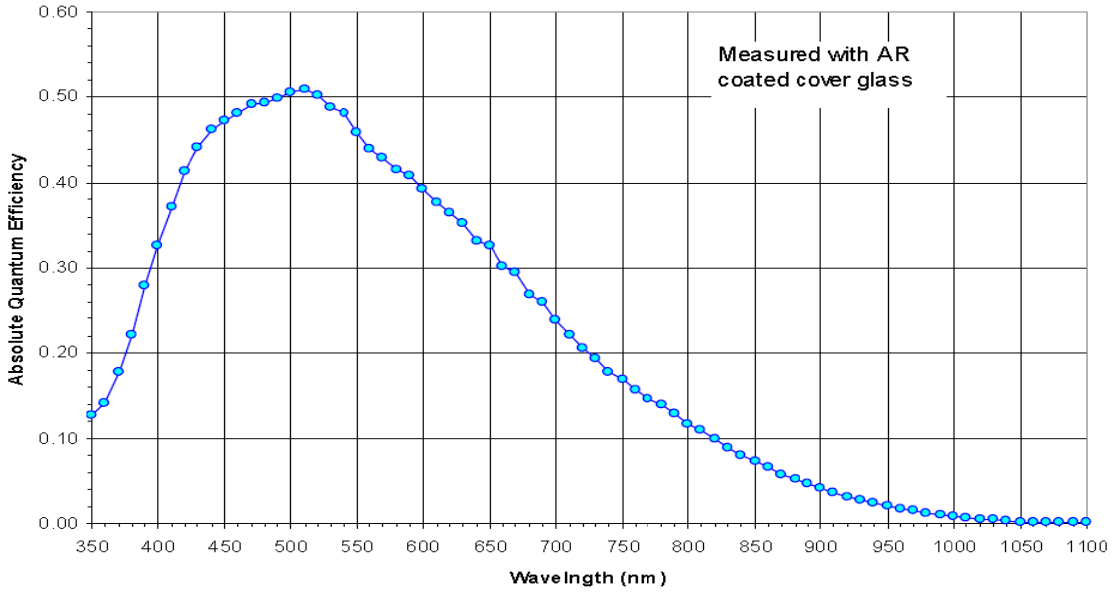


Figure 7 – Prosilica GE1660 monochrome spectral response

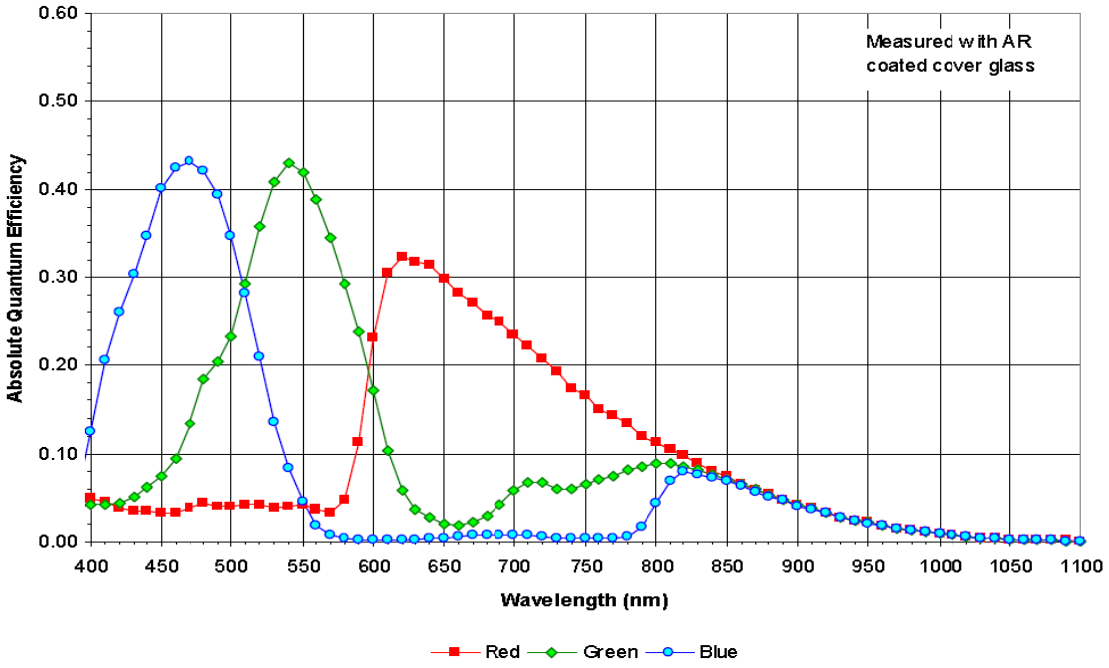


Figure 8 – Prosilica GE1660C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE1900/GE1900C
Resolution	1920 x 1080 pixels
Sensor	Kodak KAI-2093
Type	CCD Progressive
Sensor size	1 inch
Cell size	7.4µm
Lens mount	C
Max frame rate at full resolution	30 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	50 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	169g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	5µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 6: Prosilica GE1900 camera specification

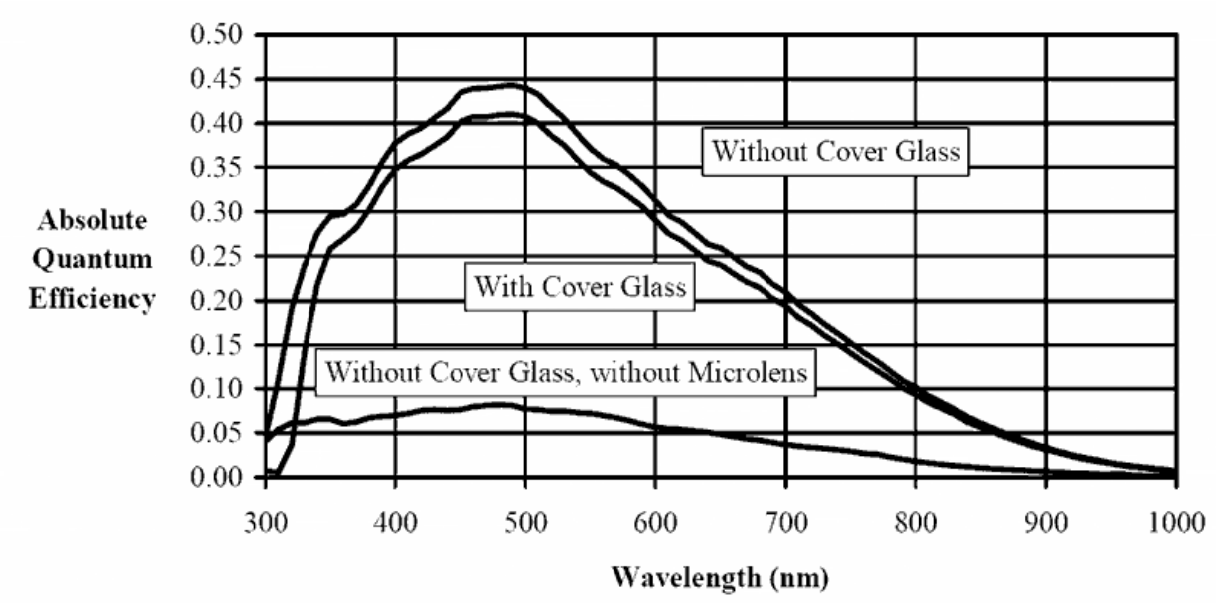


Figure 9 – Prosilica GE1900 monochrome spectral response

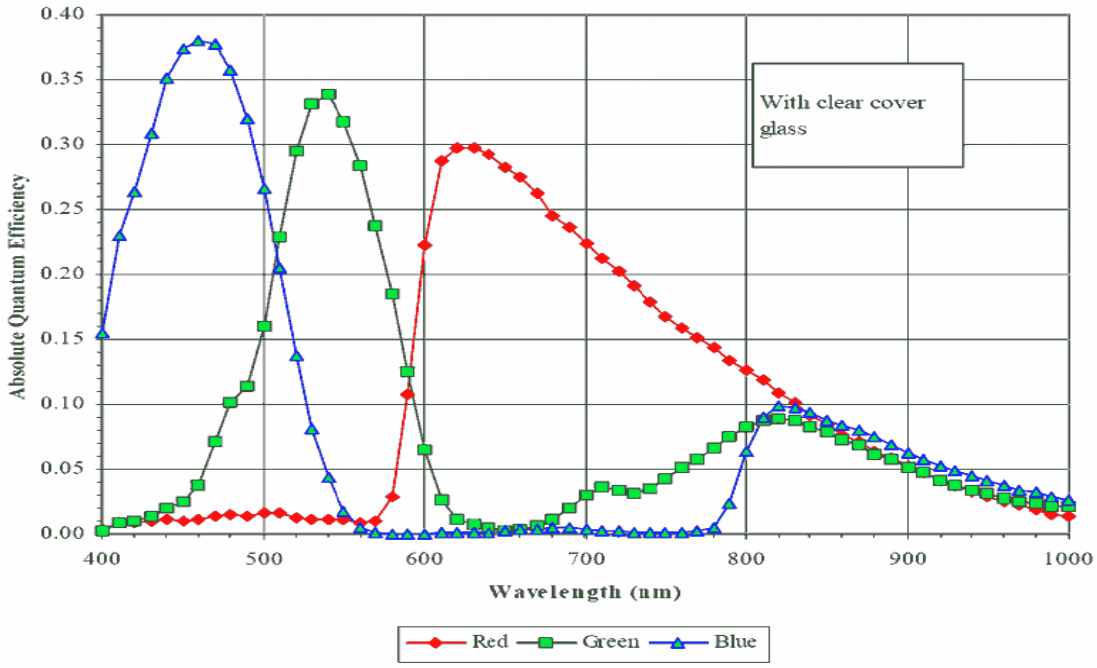


Figure 10 – Prosilica GE1900C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE1910/GE1910C
Resolution	1920 x 1080 pixels
Sensor	Kodak KAI- 02150
Type	CCD Progressive
Sensor size	2/3 inch
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	32 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	178g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	5µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 7: Prosilica GE1910 camera specification

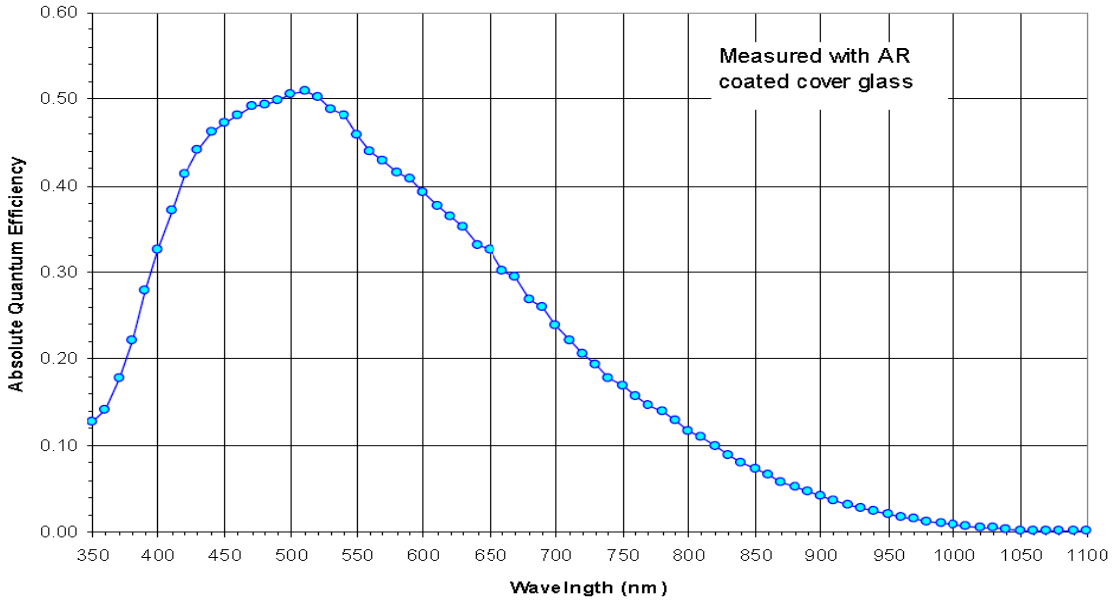


Figure 11 – Prosilica GE1910 monochrome spectral response

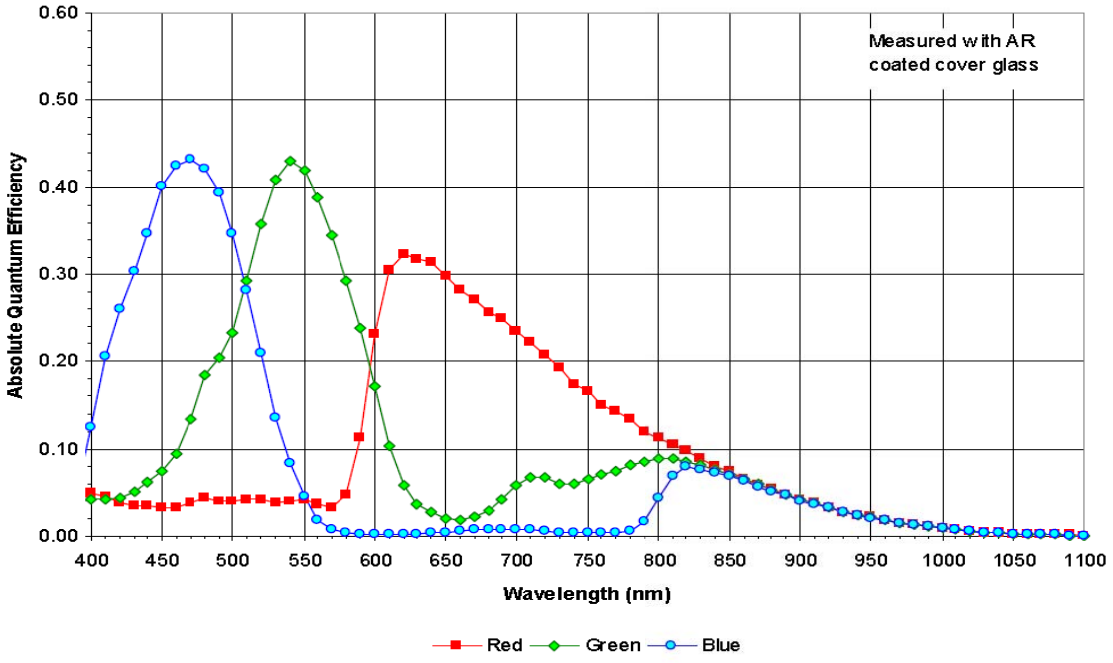


Figure 12 – Prosilica GE1910C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE2040/GE2040C
Resolution	2040 x 2048 pixels
Sensor	Kodak KAI- 04022
Type	CCD Progressive
Sensor size	1.2 inch
Cell size	7.4µm
Lens mount	C/F
Max frame rate at full resolution	15 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	75 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 5.5W (@ 12 VDC); (full resolution and maximal frame rates)
Mass	169g (without lens)
Dimensions	39mm (height) x 51mm (width) x 80mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	4.2µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 8: Prosilica GE2040 camera specification

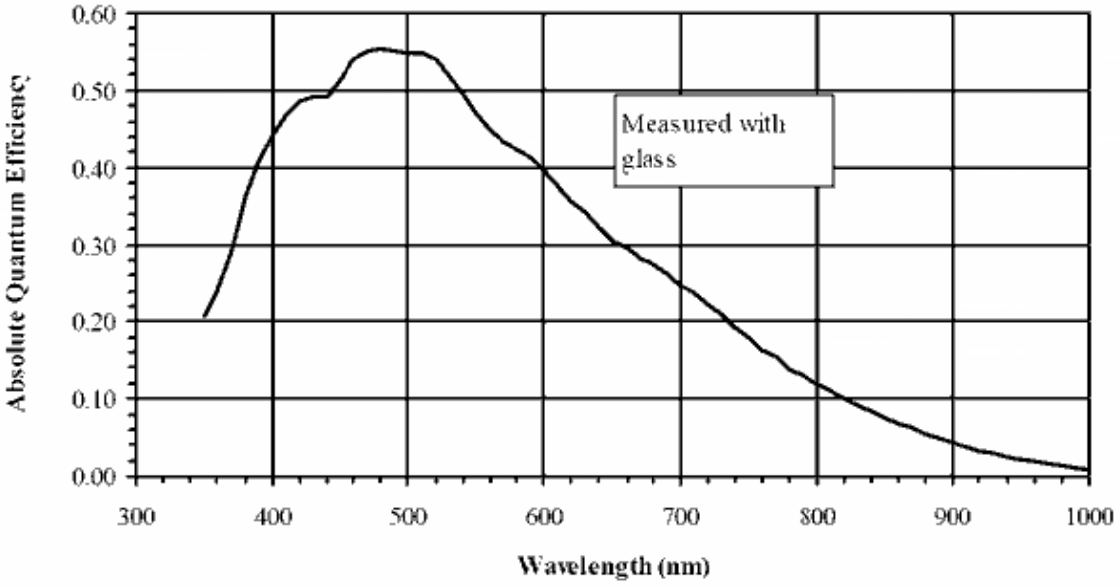


Figure 13 – Prosilica GE2040 monochrome spectral response

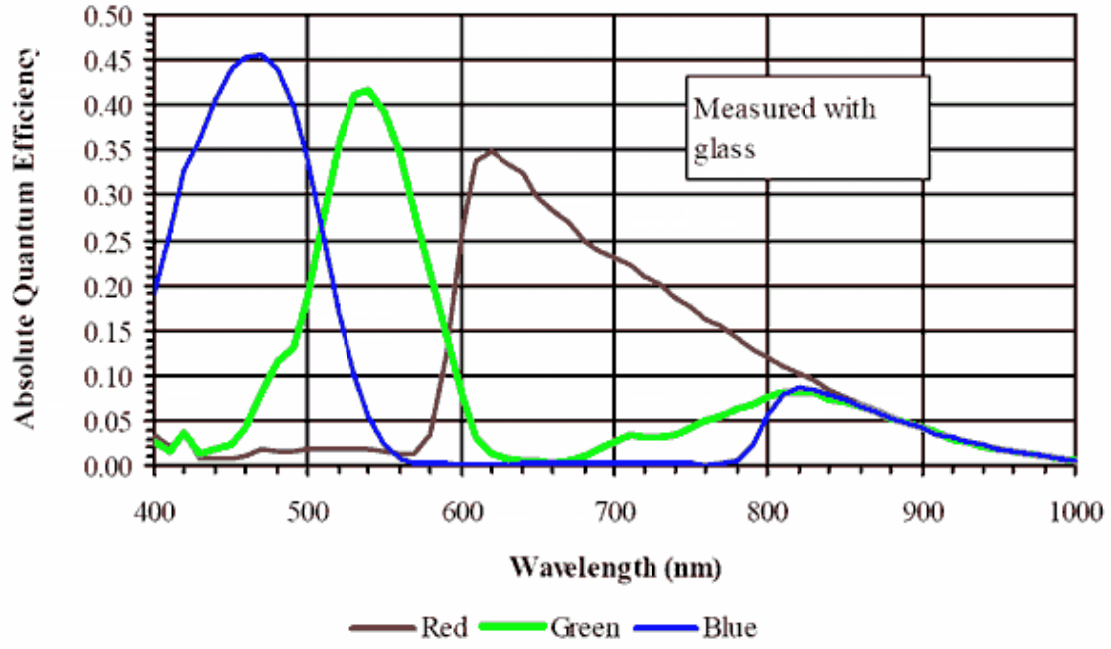


Figure 14 – Prosilica GE2040C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE4000/GE4000C
Resolution	4008 x 2672 pixels
Sensor	Kodak KAI-11002
Type	CCD Progressive
Sensor size	35mm
Cell size	9µm
Lens mount	F
Max frame rate at full resolution	5 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	625 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 6W(@ 12 VDC); (full resolution and maximal frame rates)
Mass	402g (without lens)
Dimensions	66mm (height) x 66mm (width) x 110mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	4.2µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 9: Prosilica GE4000 camera specification

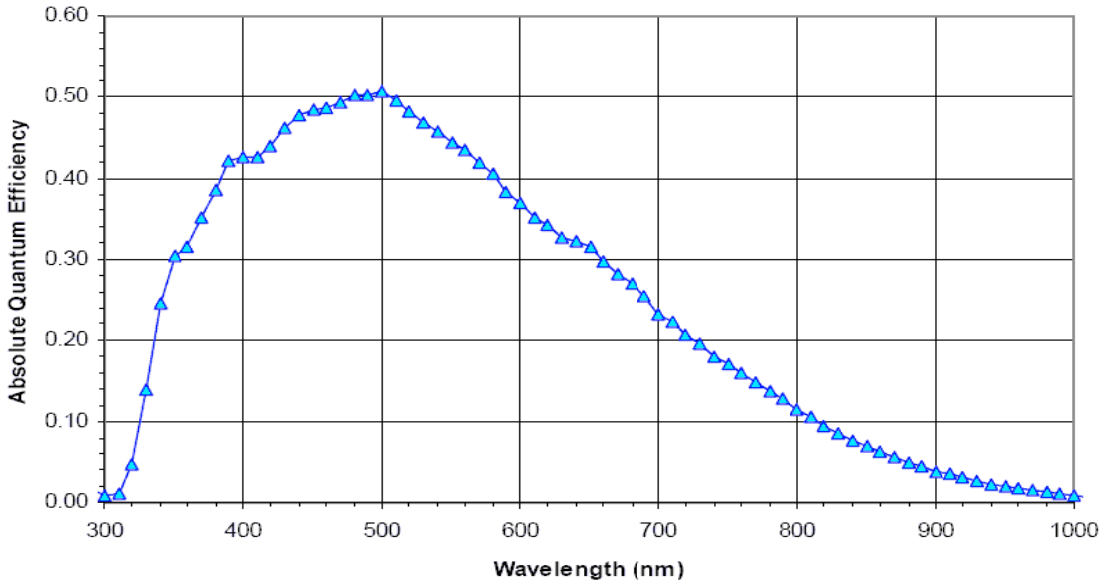


Figure 15 – Prosilica GE4000 monochrome spectral response

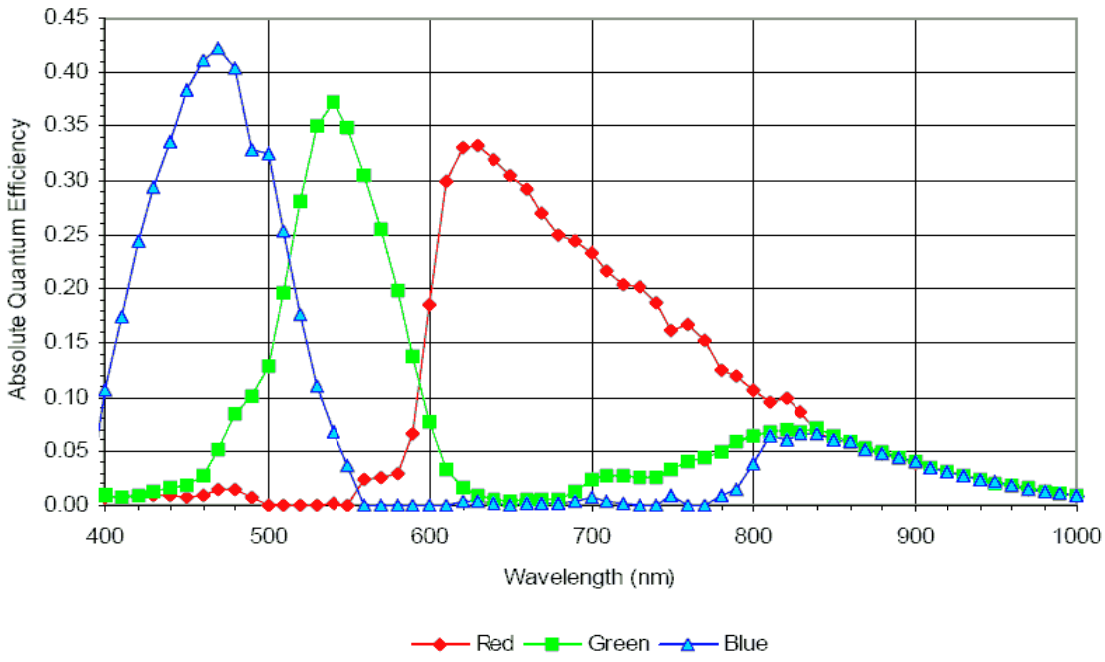


Figure 16 – Prosilica GE4000C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica	GE4900/GE4900C
Resolution	4872 x 3248 pixels
Sensor	Kodak KAI-16000
Type	CCD Progressive
Sensor size	35mm
Cell size	7.4µm
Lens mount	F
Max frame rate at full resolution	3 fps
A/D	12 bit
On-board FIFO	32 MB
Bit depth	8/12
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	625 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
TTL I/Os (galvanic isolation)	1 input, 3 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	Typical < 6W(@ 12 VDC); (full resolution and maximal frame rates)
Mass	391g (without lens)
Dimensions	66mm (height) x 66mm (width) x 110mm (length); including connectors, without tripod and lens
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	4.2µs
Trigger jitter	±10ns
Tpd	90ns
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 10: Prosilica GE4900 camera specification

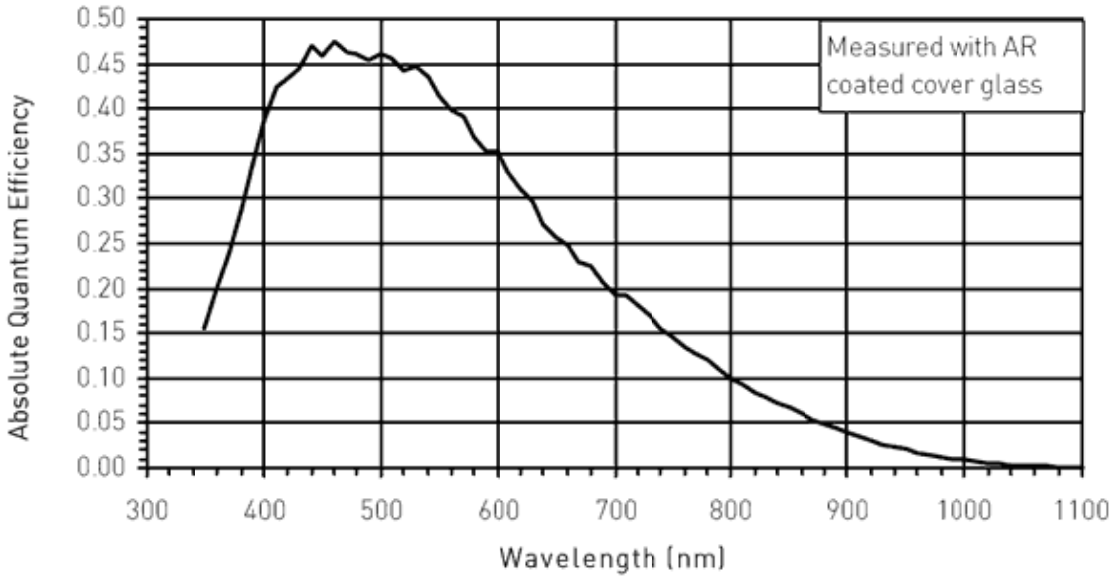


Figure 17 – Prosilica GE4900 monochrome spectral response

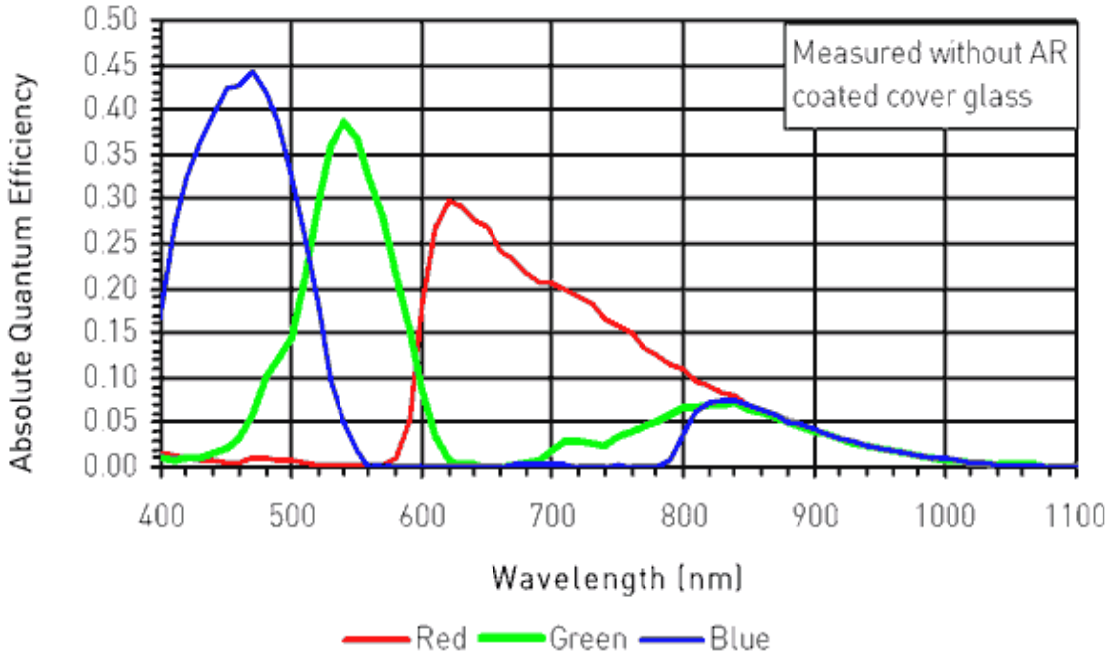


Figure 18 – Prosilica GE4900C color spectral response

Note

The design and specifications for the products described above may change without notice.

Camera attribute highlights

AVT cameras support a number of standard and extended features. The table below identifies the most interesting capabilities of this camera family. A complete listing of camera controls, including control definitions can be found in the **AVT Prosilica GigE Camera and Driver Attributes** document.

AVT Prosilica GigE Camera and Driver Attributes document online:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Software/Prosilica_software/Prosilica_firmware/AVT_Camera_and_Driver_Attributes.pdf

Control	Specification
Gain control	Manual and auto
Exposure control	Manual and auto
Whitebalance	Red and blue channel; manual and auto control
External trigger event	Rising edge, falling edge, any edge, level high, level low
External trigger delay	0 to 60 seconds; 1 us increments
Fixed rate control	0.001 fps to maximum frame rate
Imaging modes	Free-running, external trigger, fixed rate, software trigger
Sync Out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO
Region of Interest (ROI)	independent x and y control with 1 pixel resolution
Multicast	Streaming to multiple PC
Event Channel	In-camera events including exposure start and trigger are asynchronously broadcasted to the host PC
Chunk Data	Captured images are bundled with attribute information such as exposure and gain value

Table 11: Prosilica GE camera and driver attribute highlights

IR cut filter: spectral transmission

Note

All Prosilica GE color models are equipped with an infrared block filter (IR filter). This filter is employed to stop infrared wavelength photons from passing to the imaging device. If the filter is removed, images will be dominated by red and cannot be properly color balanced.

Monochrome Prosilica GE cameras do not employ an IR filter.

The figure below shows the filter transmission response for the IRC filter family from Sunex. Prosilica GE cameras utilize the IRC30 filter.

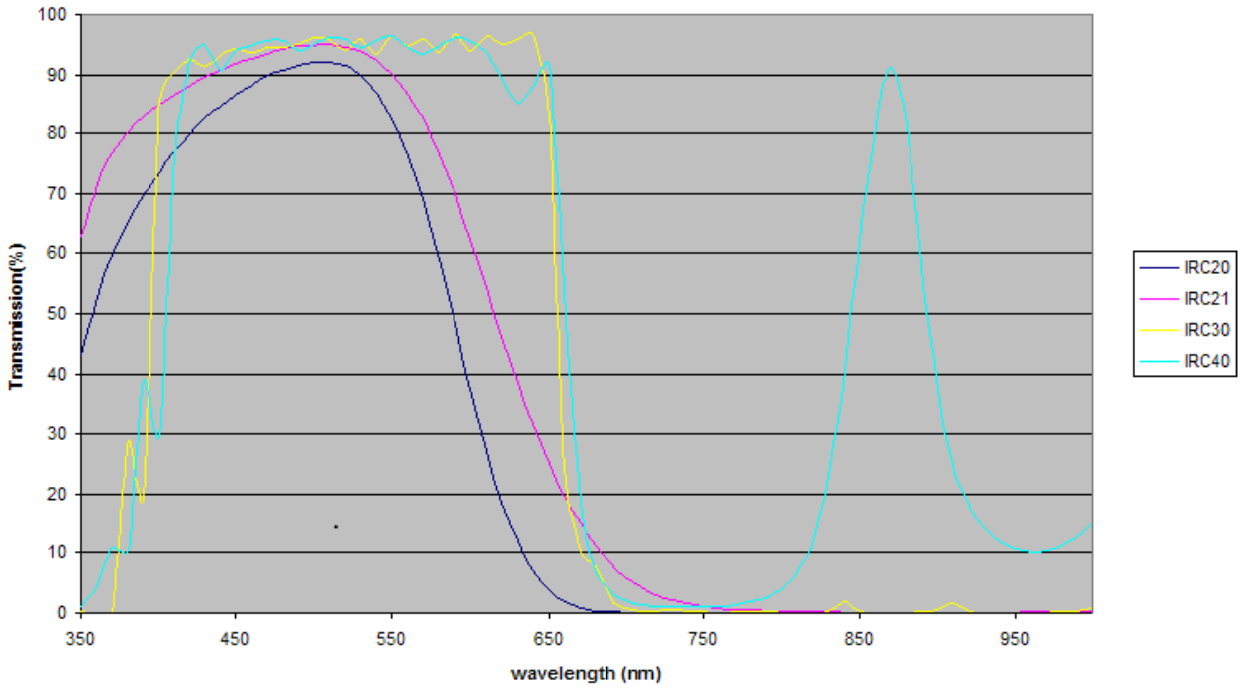


Figure 19: Sunex IRC filter transmission values

Camera dimensions

Prosilica GE (C-Mount)

GE680/C, GE1050/C, GE1650/C, GE1660/C, GE1900/C, GE1910/C, GE2040/C

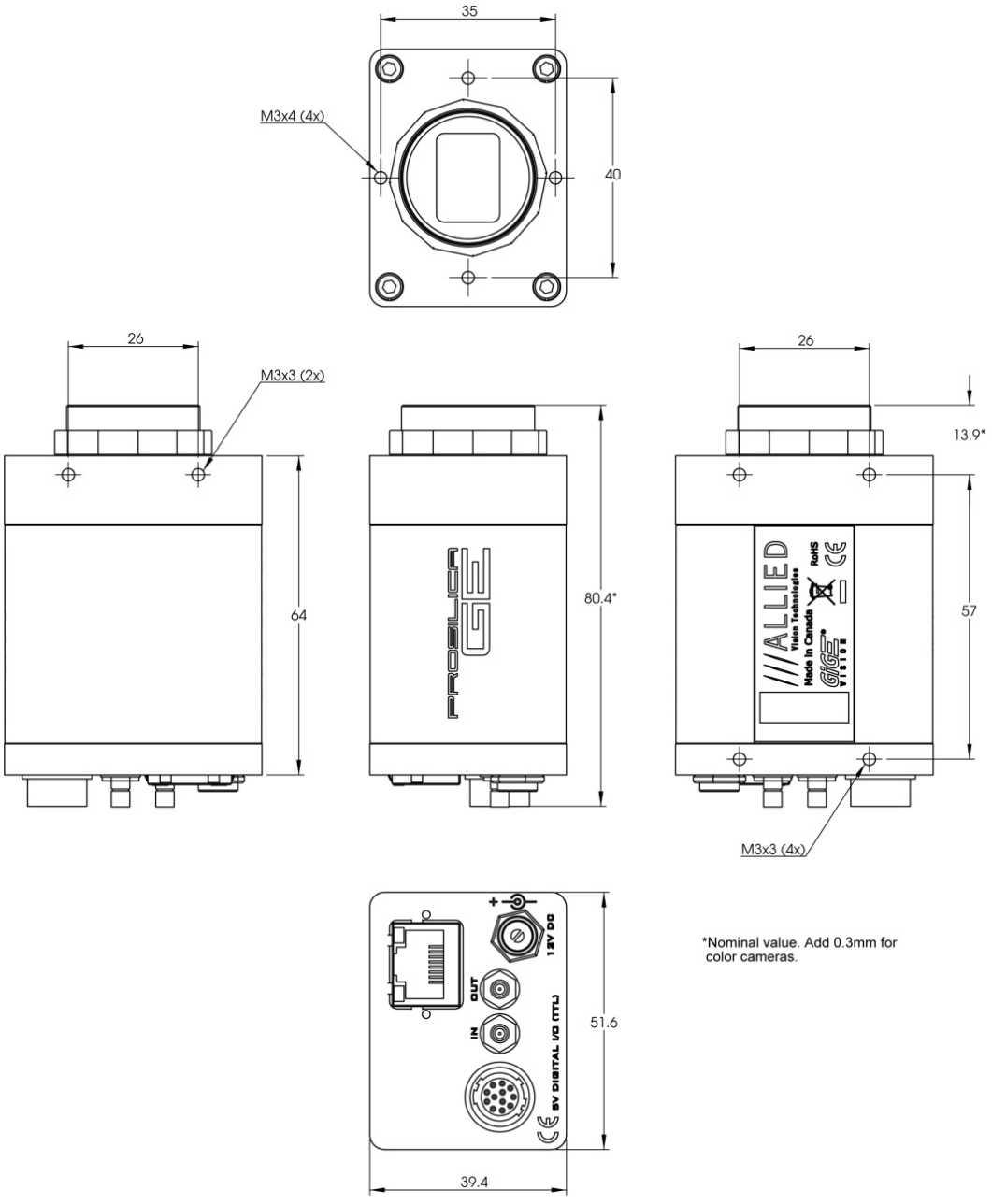


Figure 20: Prosilica GE models (C-Mount) mechanical dimensions

Prosilica GE (F-mount)

GE2040/C option

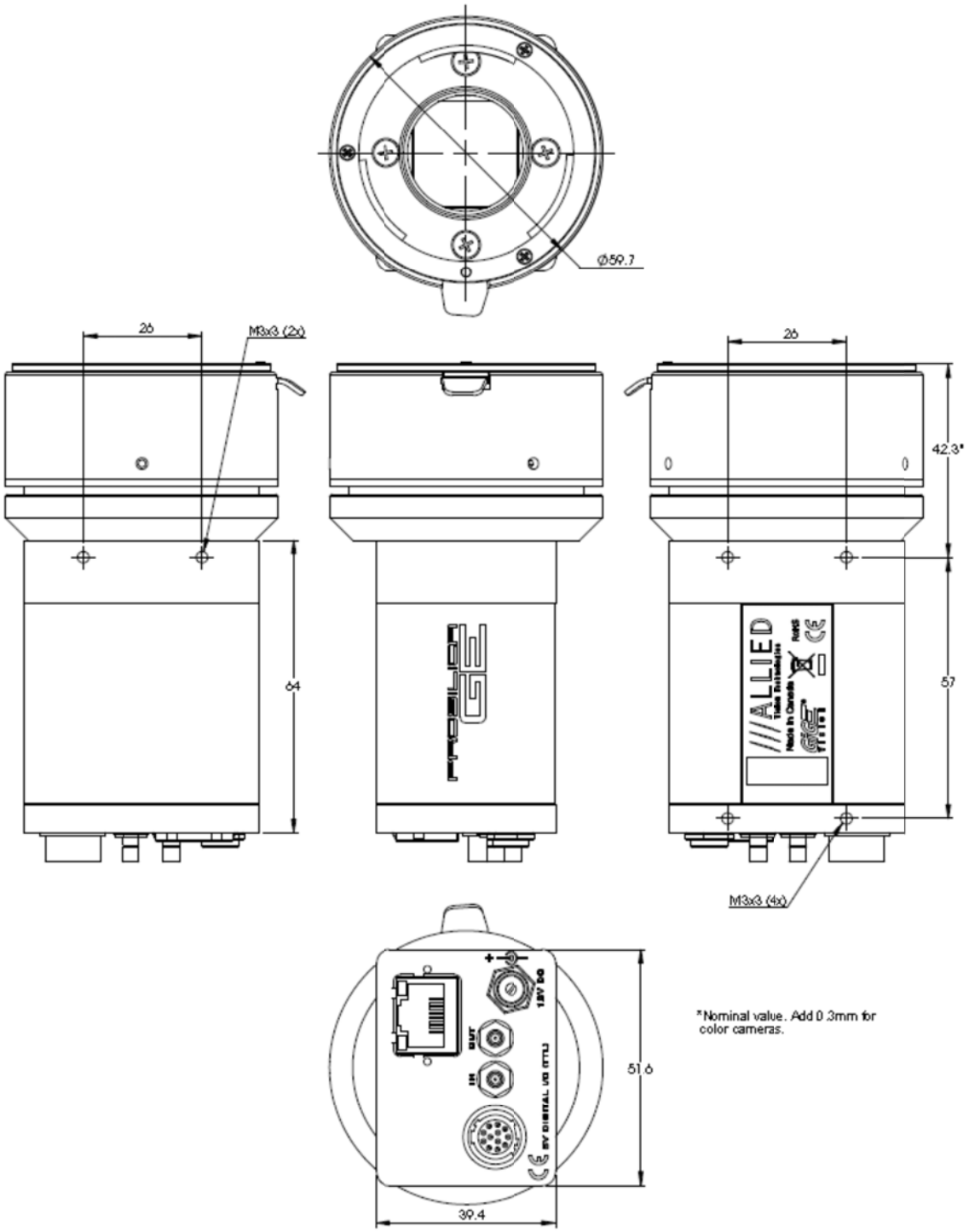


Figure 21: Prosilica GE (F-Mount) models mechanical dimensions

Prosilica GE large format (F-mount)

GE4000/C, GE4900/C

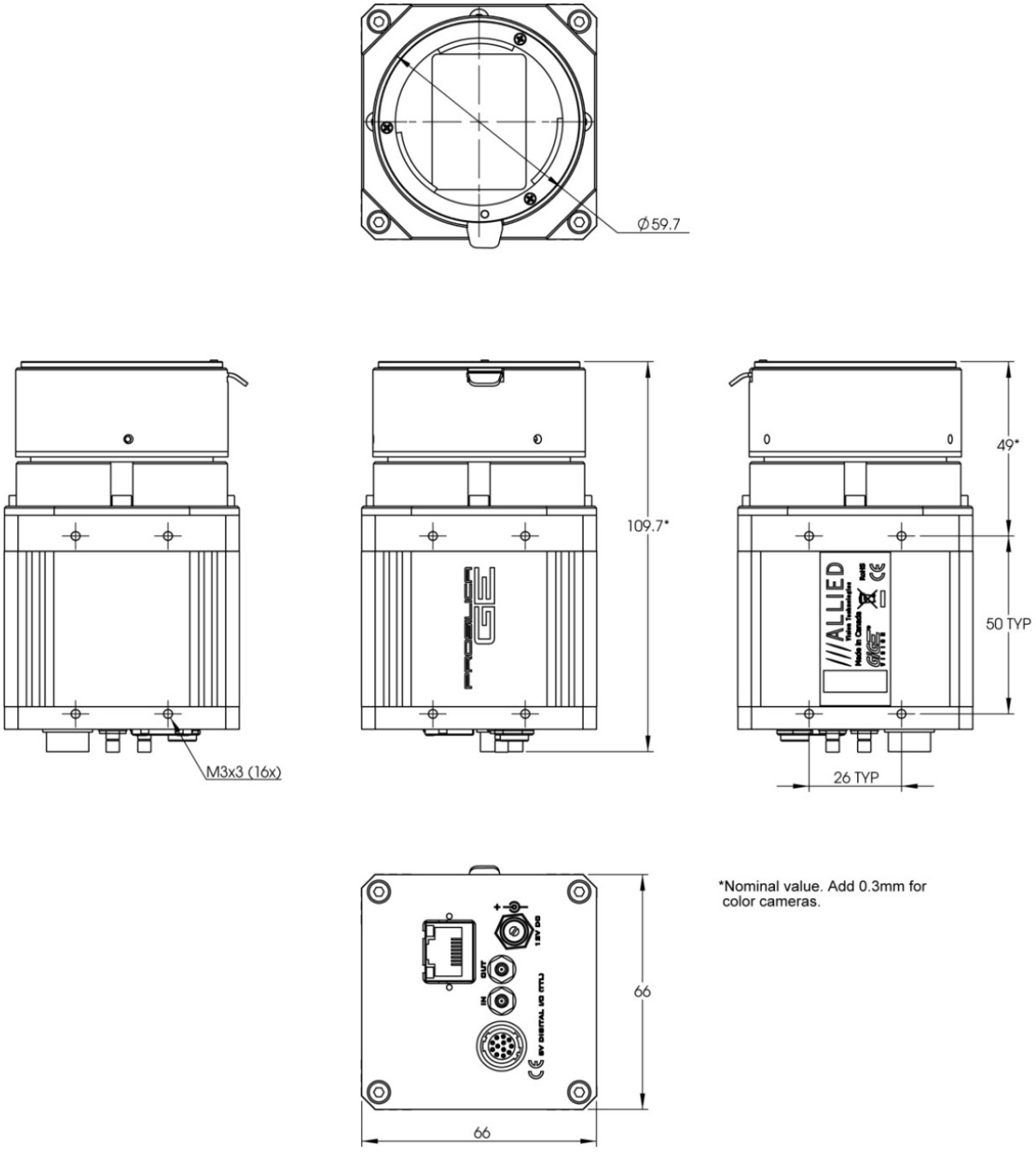


Figure 22: Prosilica GE large format (F-Mount) models mechanical dimensions

Tripod adapter

A **Prosilica GE** camera can be mounted on a camera tripod by using this mounting plate. The same mounting plate can be used for all models within the GE camera family.

Note

The Prosilica GE tripod mount can be provided by AVT
P/N: 02-5000A

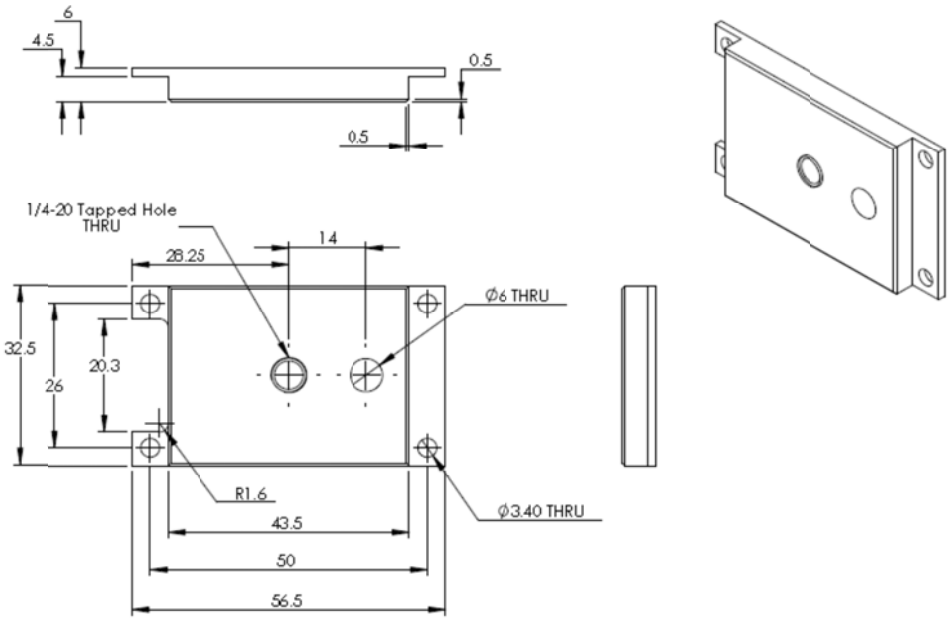


Figure 23: Prosilica GE tripod mount mechanical drawing

Adjustment of lens mount

Caution

The C-mount is adjusted at the factory and should not require adjusting.
If for some reason, the lens mount requires adjustment, use the following method.

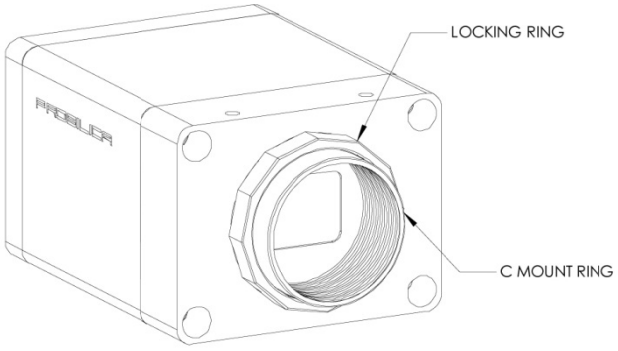


Figure 24: Prosilica GE (C-mount) camera front view

Loosen Locking Ring

Use an adjustable wrench to loosen locking ring. Be careful not to scratch the camera. When the locking ring is loose, unthread the ring a few turns from the camera face.

Note

A wrench suitable for this procedure can be provided by AVT P/N 02-5003A.

Image to Infinity

Use a c-mount compatible lens that allows an infinity focus. Set the lens to infinity and image a distant object. The distance required will depend on the lens used but typically 30 to 50 feet should suffice. Make sure the lens is firmly threaded onto the c-mount ring. Rotate the lens and c-mount ring until the image is focused. Carefully tighten locking ring. Recheck focus.

Caution

The F-mount is adjusted at the factory and should not require adjusting.
If for some reason, the lens mount requires adjustment, use the following method.

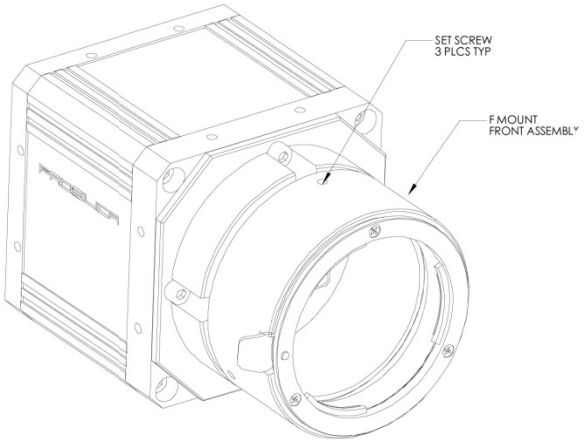


Figure 25: Prosilica GE (F-Mount) camera front view

Attach F-mount compatible lens

Use an F-mount compatible lens that allows an infinity focus. Attach the lens to the camera using a counter-clockwise rotation of about a quarter turn. The lens should snap into place and the lens flange and camera flange should mate over the full circumference.

Loosen F-MOUNT FRONT ASSEMBLY

Use a 1.5mm hex wrench to loosen the 3 set screws than hold the F-mount front assembly to the camera body.

Image to Infinity

Set the lens to infinity and image a distant object. The distance required will depend on the lens used, but typically 30 to 50 feet should suffice. Gently move the F-mount front until focused, then lock.

Note

Prosilica GE cameras are shipped with C-mount or F-mount. The camera can also be built with a CS-mount on request.

Camera interfaces

This chapter gives you information on Gigabit Ethernet port, inputs and outputs and trigger features.

WWW

For accessories like cables see:
http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html

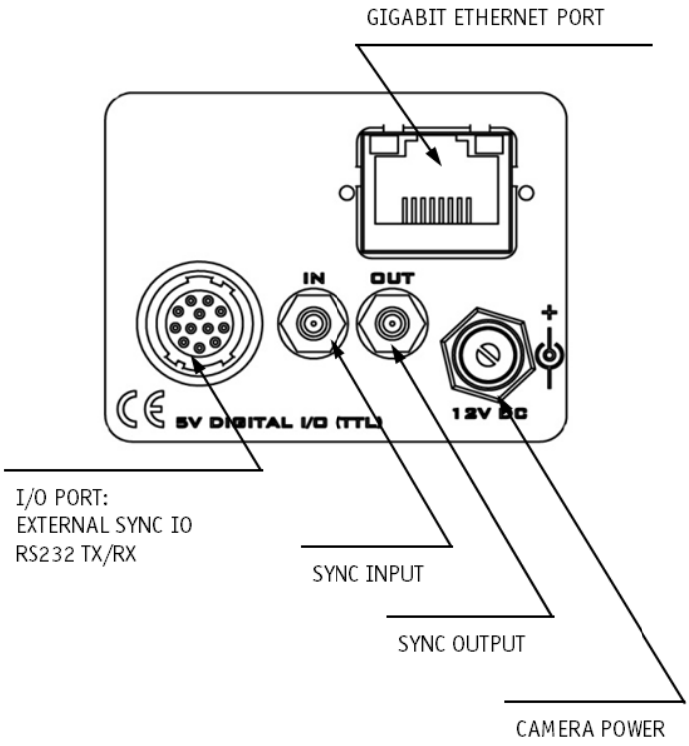
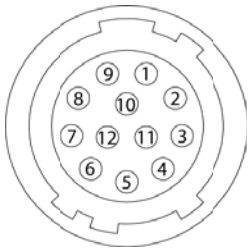


Figure 26: Prosilica GE connection diagram

Camera I/O connector pin assignment



Pin	Signal	Direction	Level	Description
1	Camera In	In	TTL max. 5 V	Camera Input Galvanic isolation (GPIn1)
2	Camera Out 2	Out	TTL max. 5 V	Camera Output 2 Galvanic isolation (GPOut2)
3	Camera Out 3	Out	TTL max. 5 V	Camera Output 3 Galvanic isolation (GPOut3)
4	RxD RS232	In	RS232	Terminal Receive Data
5	TxD RS232	Out	RS232	Terminal Transmit Data
6	Reserved	---	---	---
7	Reserved	---	---	---
8	Reserved	---	---	---
9	Reserved	---	---	---
10	Isolated GND	---	---	---
11	Isolated GND	---	---	---
12	Isolated GND	---	---	---

Table 12: Prosilica GE I/O connector definition

The General Purpose I/O port uses a Hirose HR10A-10R-12SB connector on the camera side. The mating cable connector is Hirose HR10A-10P-12P.

Note

This cable side Hirose connector can be purchased from AVT.
P/N: K7600039

Camera In

This input signal (GPIn1) allows the camera to be synchronized to an external event. The camera can be programmed to trigger on the rising edge, falling edge, both edges, or level of this signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

DO NOT EXCEED 5.5V ON SIGNAL INPUTS.
Refer to Chapter Camera I/O connector external circuit example on page 44 for wiring information.

Camera Out 2 and Camera Out 3

These signals (GPOut2 and GPOut3) function as outputs and can be configured as follows:

Exposing	Corresponds to when camera is integrating light.
Trigger Ready	Indicates when the camera will accept a trigger signal.
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras.
Readout	Valid when camera is reading out data.
Imaging	Valid when camera is exposing or reading out.
Strobe	Programmable pulse based on one of the above events.
GPO	User programmable binary output.

Any of the above signals can be set for active high or active low.

RS-232 RXD and RS-232 TXD

These signals are RS-232 compatible. These signals allow communication from the host system via the Ethernet port to a peripheral device connected to the camera. Note that these signals are not isolated and therefore careful attention should be used when designing cabling in noisy environments.

Isolated Ground

Isolated Ground must be connected to the user's external circuit ground if Sync Input 1 or Sync Output 1 is to be used.

Signal Ground

Signal Ground must be connected to the user's external circuit ground if Camera Input 2 or Camera Output 2 is to be used or if the RS-232 port is to be used. Note that Signal Ground is common with Power Ground however it is good practice to provide a separate ground connection for power and signaling when designing the cabling.

Video Iris

This signal can be used to drive the video input of a video iris lens. See Addendum.

Reserved

These signals are reserved for future use and should be left disconnected.

Sync input

The Mini-SMB Trigger Input is internally connected to the Camera Input (GPIn1) of the General Purpose I/O Port described above.

The Mini-SMB port on the camera uses an Amphenol 903-406J-51R connector. A suitable mating cable connector is Amp 413985-3 which can be used with RG174 coaxial cable.

Note

SMB to SMB cables can be purchased from AVT with various lengths. The 3 meter length uses the following:
P/N 02-6007A

Sync output

This Mini-SMB trigger output (GPOut1) is NOT internally connected to other camera output pins of the Camera I/O connector described above.

This connector is particularly useful for triggering multiple cameras in a “daisy chain” fashion. It can be configured as follows:

Exposing	Corresponds to when camera is integrating light.
Trigger Ready	Indicates when the camera will accept a trigger signal.
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras.
Readout	Valid when camera is reading out data.
Imaging	Valid when camera is exposing or reading out.
Strobe	Programmable pulse based on one of the above events.
GPO	User programmable binary output.

Any of the above signals can be set for active high or active low. The Mini-SMB port on the camera uses an Amphenol 903-406J-51R connector. A suitable mating cable connector is Amp 413985-3 which can be used with RG174 coaxial cable.

Note

SMB to BNC cables can be purchased from AVT.
P/N 02-6014A

Camera power

The Prosilica GE camera family supports a wide input power voltage range. The camera will not power in reverse polarity. Exceeding the voltage range specified below will damage the camera.

Caution

5V - 24V. 12V Nominal.

Note

A 12V power adaptor with barrel connector can be ordered from AVT:

P/N 02-8003A North America Supply
P/N 02-8010C Universal Supply

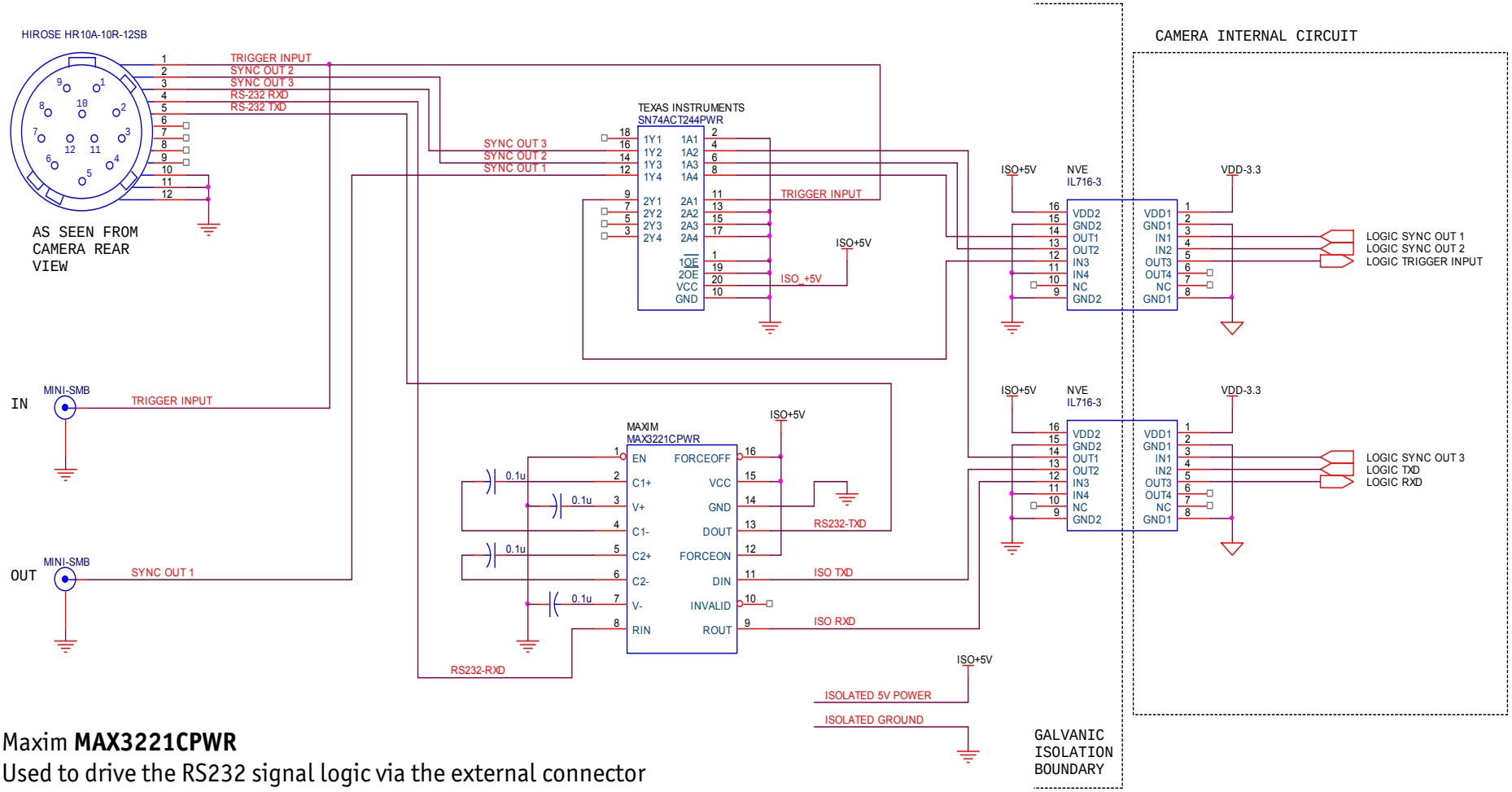
Gigabit Ethernet port

The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. We recommend using Category 5e or Category 6 compatible cabling and connectors for best performance.

Note

- Cable lengths up to 100 m are supported.
- The 8-pin RJ-45 jack has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).
- Cables with screw-lock connectors are available from AVT: http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html

Camera I/O connector internal circuit diagram

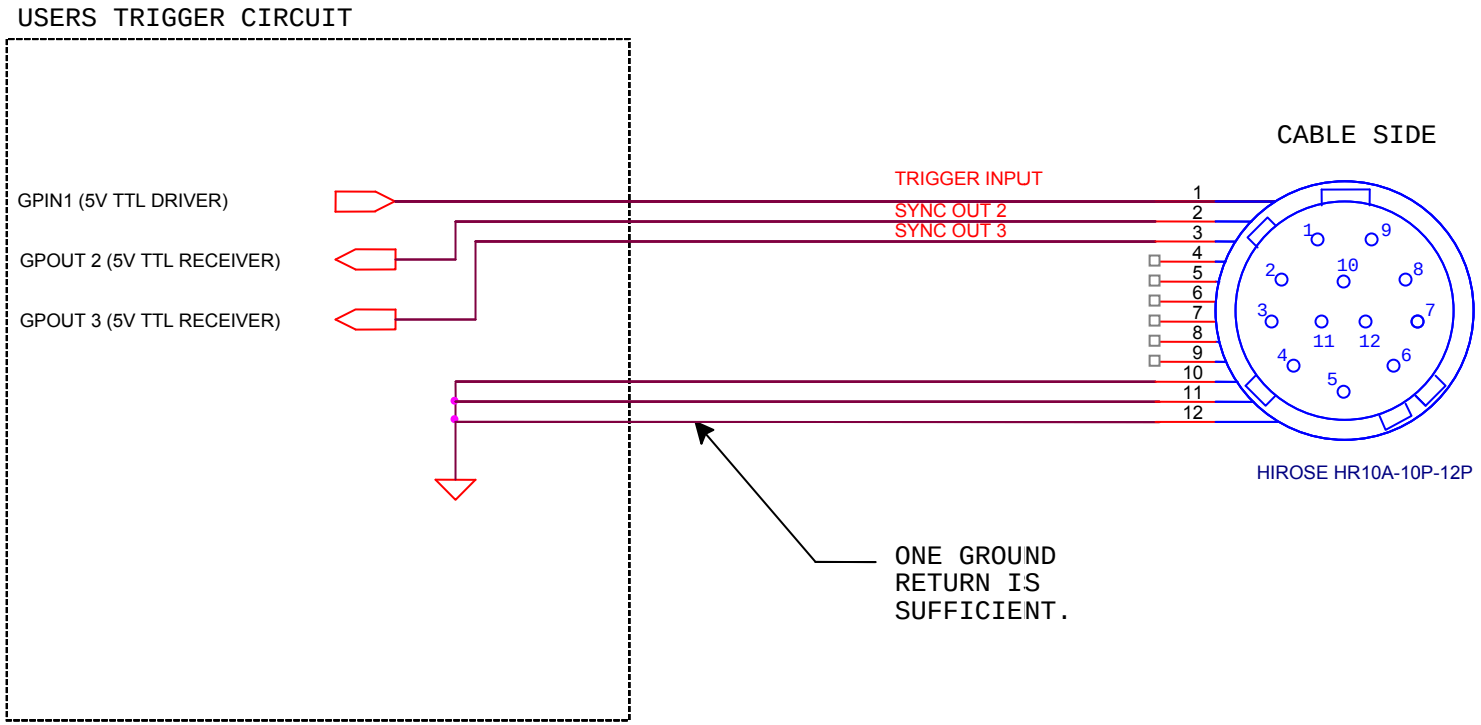


Maxim **MAX3221CPWR**
Used to drive the RS232 signal logic via the external connector

Texas Instruments **SN74ACT244PWR**
Used as trigger buffer/driver. The required trigger input current is less than 10uA and the maximum sync output current is 24mA.

Figure 27: Prosilica GE internal circuit diagram

Camera I/O connector external circuit example

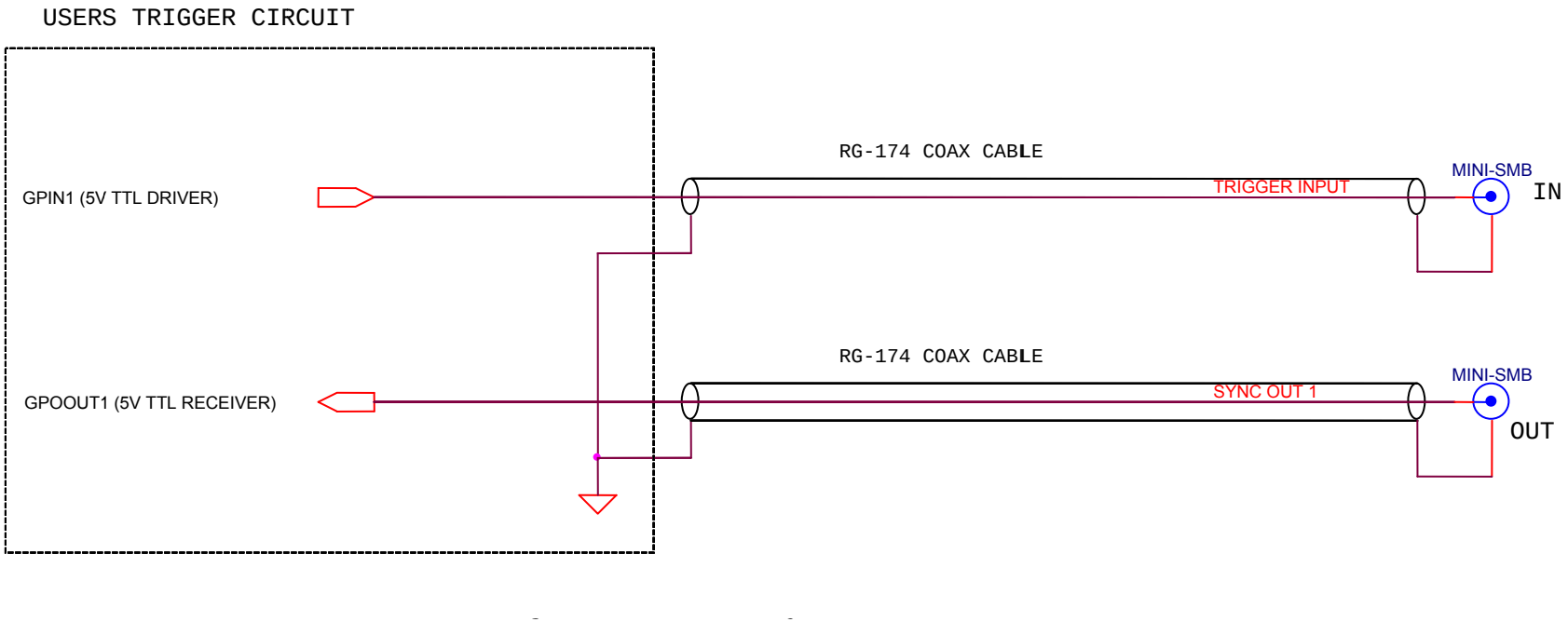


Caution

Input: Incoming trigger must be able to source 10uA.
Output: Sync output current is 24mA.

The trigger circuit is connected to a Texas Instruments SN74ACT244PWR buffer/driver inside the camera.

Sync connectors external circuit example



Caution

Input: The required trigger input current is less than 10uA
Output: The maximum sync output current is 24mA.

The trigger circuit is connected to a Texas Instruments SN74ACT244PWR buffer/driver inside the camera. Note that the trigger input signal is not terminated to match the cable impedance.

Notes on triggering

Timing diagram

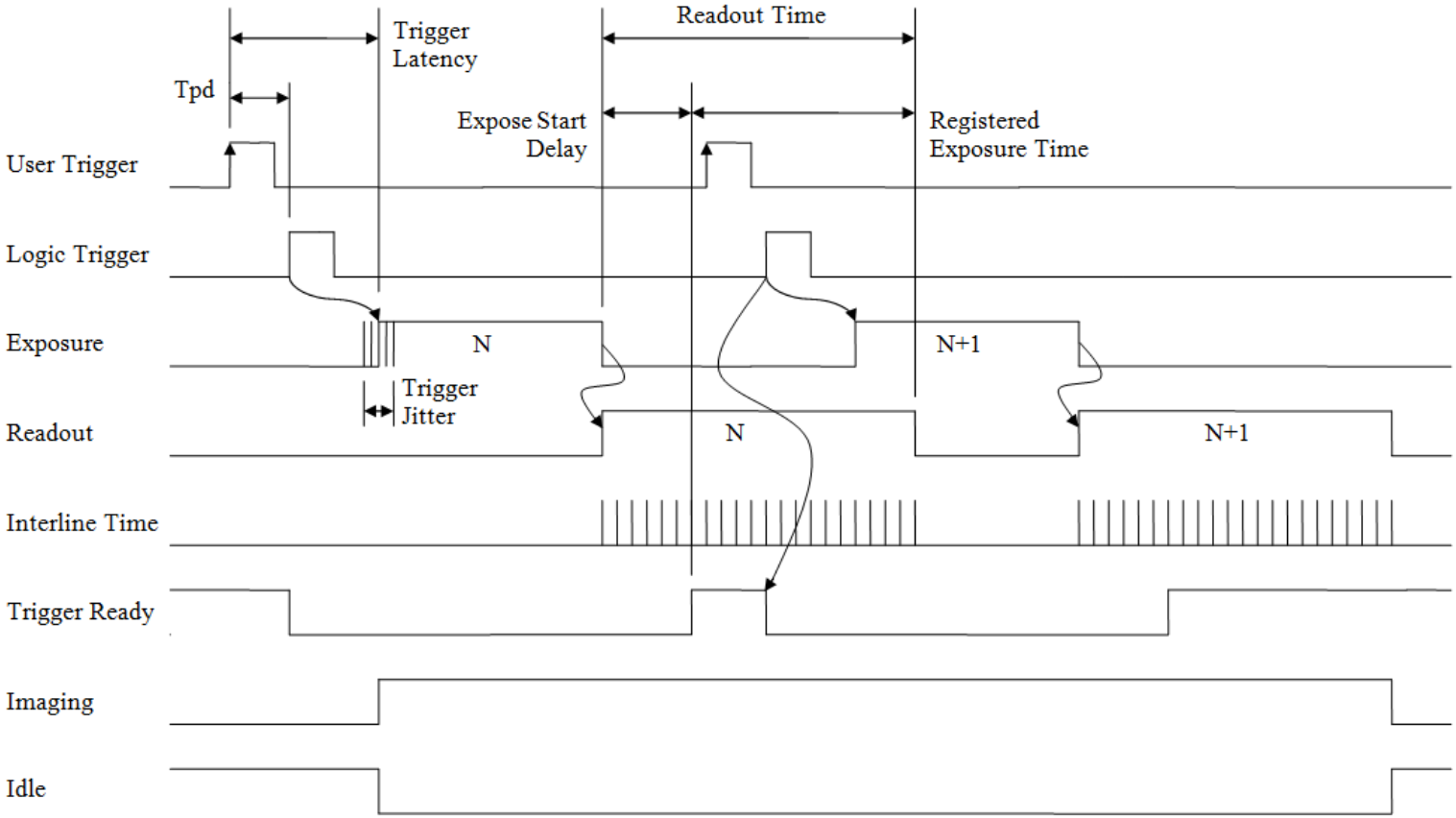


Figure 30: Prosilica GE internal signal timing waveforms

Signal definitions

Term	Definition
User Trigger	Trigger signal applied by the user (hardware trigger, software trigger)
Logic Trigger	Trigger signal seen by the camera internal logic (not visible to the user)
Tpd	Propagation delay between the User Trigger and the Logic Trigger
Exposure	… is high when the camera image sensor is integrating light.
Readout	… is high when the camera image sensor is reading out data.
Trigger Latency	Time delay between the User Trigger and the start of Exposure
Trigger Jitter	Error in the Trigger Latency Time
Trigger Ready	… indicates to the user that the camera will accept the next trigger.
Registered Exposure Time	… is the Exposure Time value currently stored in the camera memory.
Exposure Start Delay	… is the Registered Exposure Time subtracted from the Readout time and indicates when the next Exposure cycle can begin such that the Exposure will end after the current Readout.
Interline Time	… is the time between sensor row readout cycles.
Imaging	… is high when the camera image sensor is either exposing and/or reading out data.
Idle	… is high if the camera image sensor is not exposing and/or reading out data.

Table 13: Explanation of signals in timing diagram

Trigger rules

Note

The **User Trigger pulse width** should be at least three times the width of the Trigger Latency as indicated in Chapter Specifications on page 11.

- The **end of Exposure** will always trigger the next Readout.
- The **end of Exposure** must always end after the current Readout.
- The **start of Exposure** must always correspond with the Interline Time if Readout is true.
- **Expose Start Delay** equals the Readout time minus the Registered Exposure Time.

Triggering during the Idle State

For applications requiring the shortest possible Trigger Latency and the smallest possible Trigger Jitter the User Trigger signal should be applied when Imaging is false and Idle is true.

In this case, Trigger Latency and Trigger Jitter are as indicated in the Specifications section.

Triggering during the Readout State

For applications requiring the fastest triggering cycle time whereby the camera image sensor is exposing and reading out simultaneously, then the User Trigger signal should be applied as soon as a valid Trigger Ready is detected.

In this case, Trigger Latency and Trigger Jitter can be up to 1 line time since Exposure must always begin on an Interline boundary.

Firmware update

Firmware updates are carried out via the Ethernet connection. AVT provides an application for all GigE cameras which loads firmware to the camera using a simple interface.

New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and complete the firmware update if necessary.

www

Download the latest GigE firmware loader from the AVT website:
http://www.alliedvisiontec.com/us/support/downloads/firmware.html

Note

To determine the current firmware version loaded onto the camera, read the camera's Device Firmware attribute using **GigE Sample Viewer** or third party applications like NI's Measurement and Acquisition assistant.

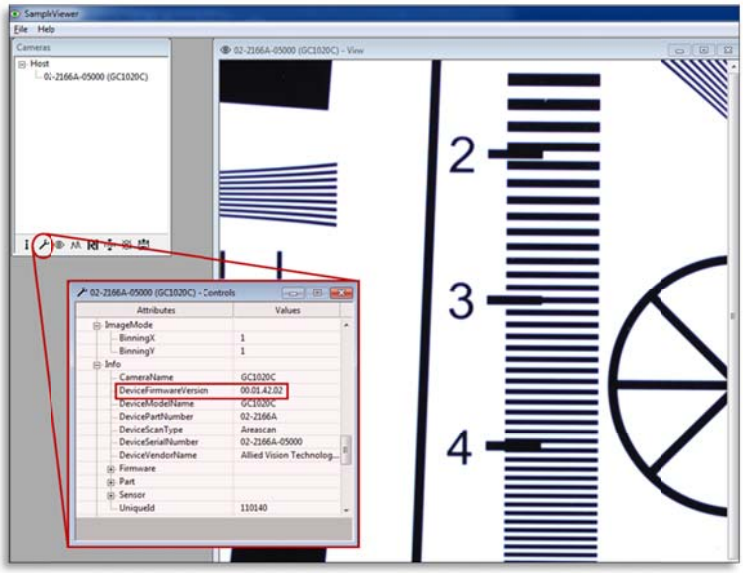


Figure 31: Screenshot of GigE Sample Viewer controls window

Resolution and ROI frame rates

This section aims to provide users with performance information which identifies the impact of reducing the region of interest on the camera's maximum frame rate.

Note

- The camera frame rate can be increased by reducing the camera's Height attribute, resulting in a decreased region of interest (ROI) or "window".
- The camera frame rate can also be increased by increasing the camera's BinningY attribute, resulting in a vertically scaled image (less overall height with same field of view).
- There is no frame rate increase with reduced width
- Frame rate data was generated using StreamBytesPerSecond equals 120 MB and an 8 bit pixel format such as Mono8 or Bayer8

CAMERA: Prosilica GE680

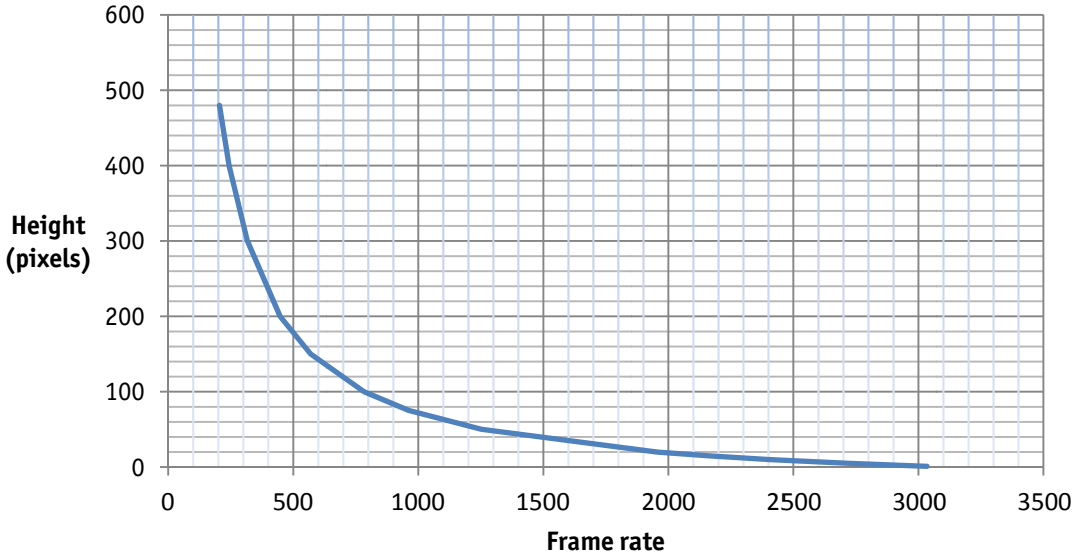


Figure 32: Maximum frame rate versus region height for GE680

CAMERA: Prosilica GE1050

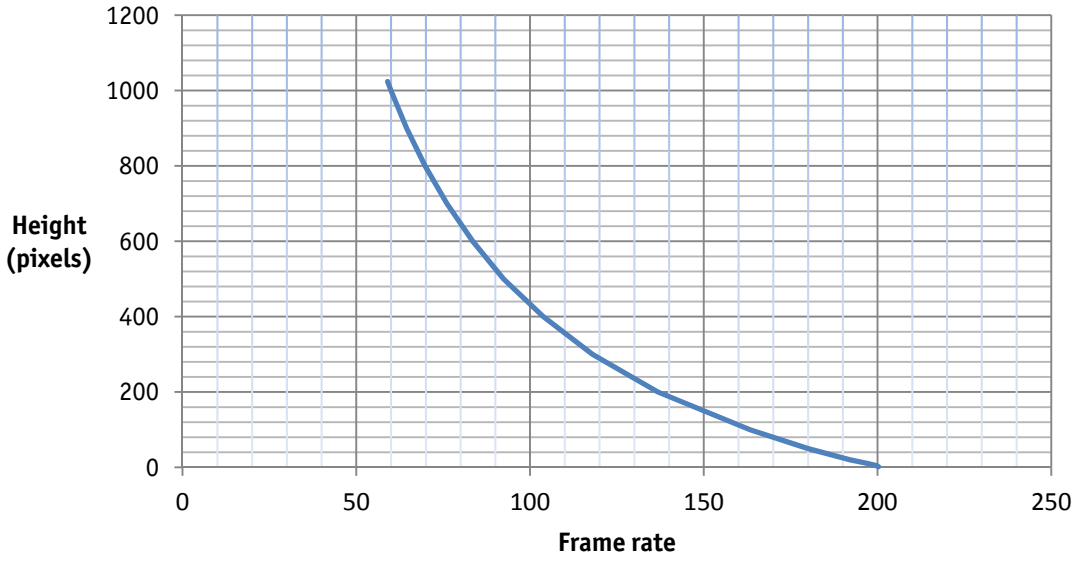


Figure 33: Maximum frame rate versus region height for GE1050

CAMERA: Prosilica GE1650

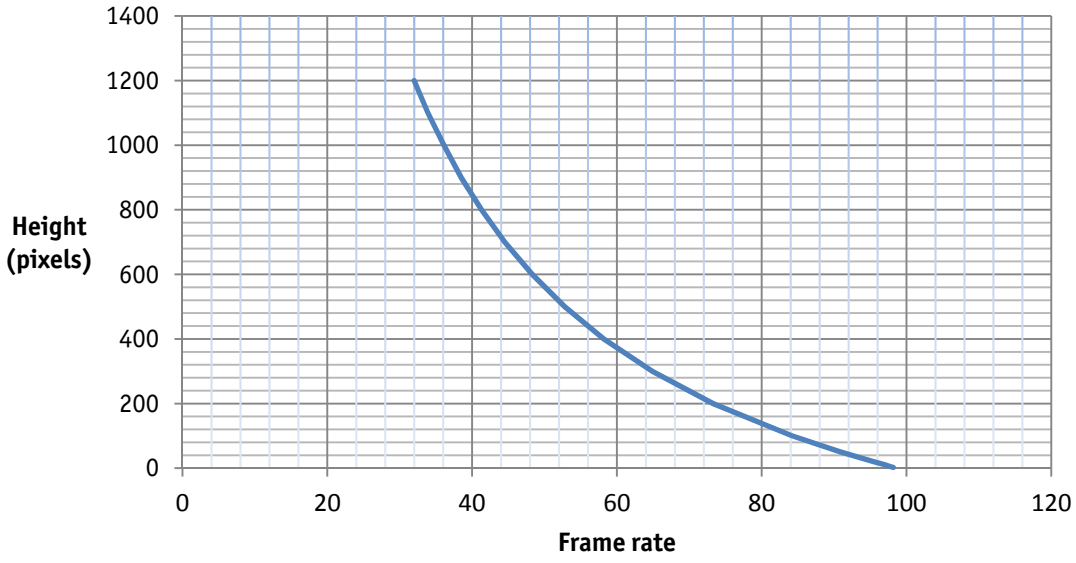


Figure 34: Maximum frame rate versus region height for GE1650

CAMERA: Prosilica GE1660

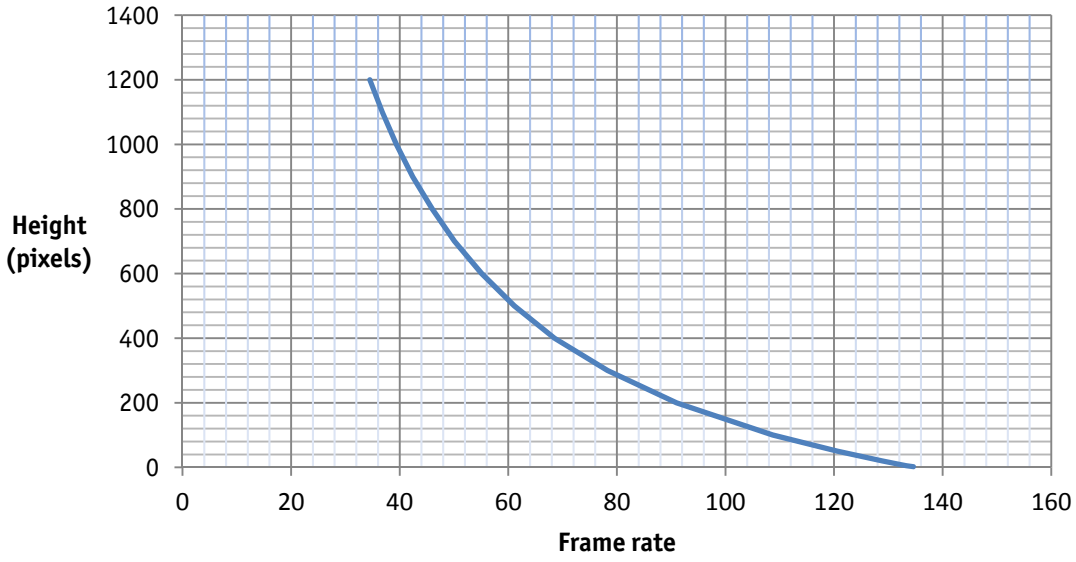


Figure 35: Maximum frame rate versus region height for GE1660

CAMERA: Prosilica GE1900

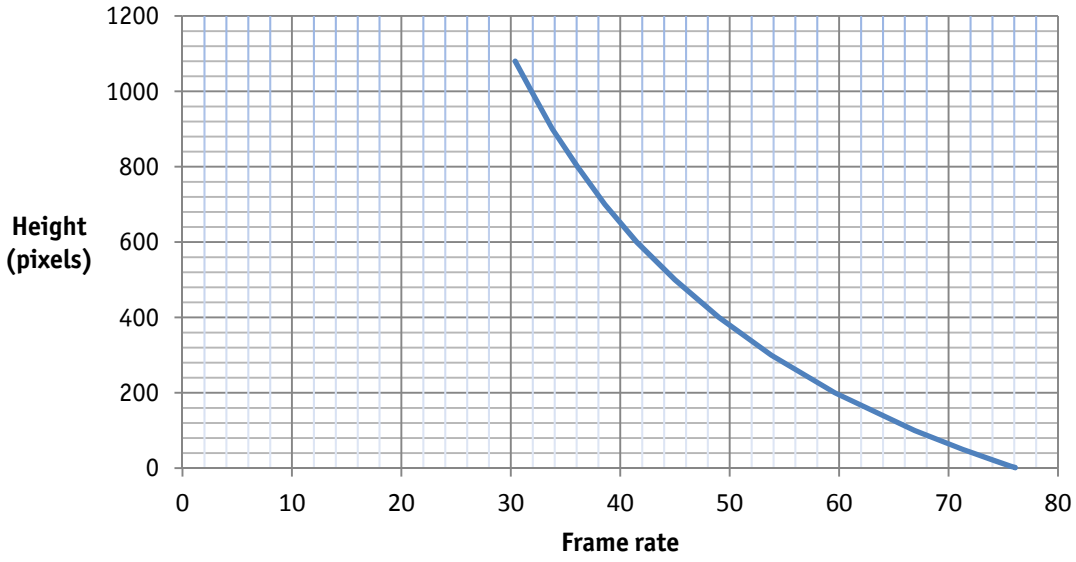


Figure 36: Maximum frame rate versus region height for GE1900

CAMERA: Prosilica GE1910

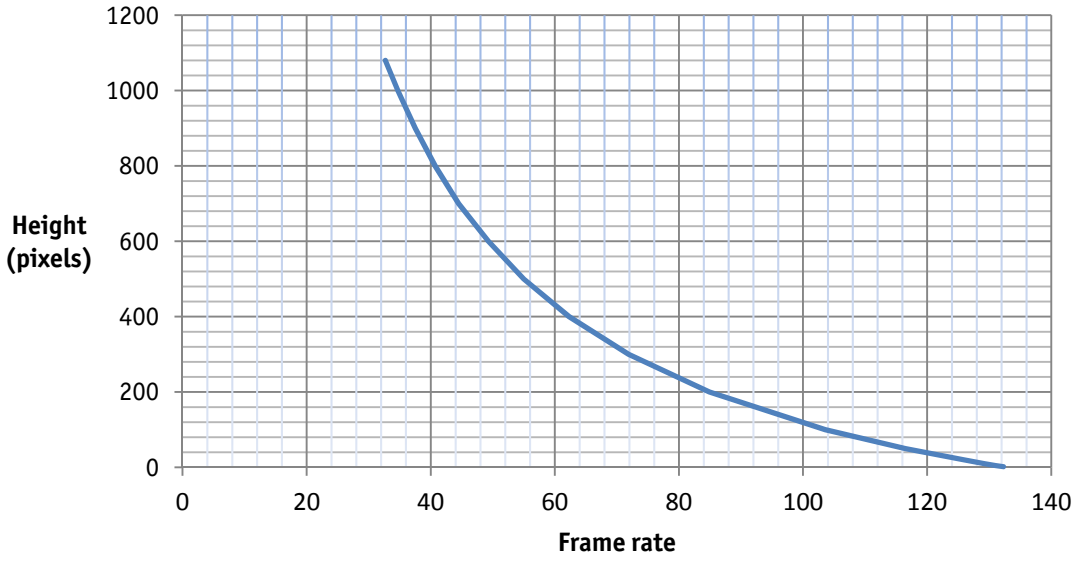


Figure 37: Maximum frame rate versus region height for GE1910

CAMERA: Prosilica GE2040

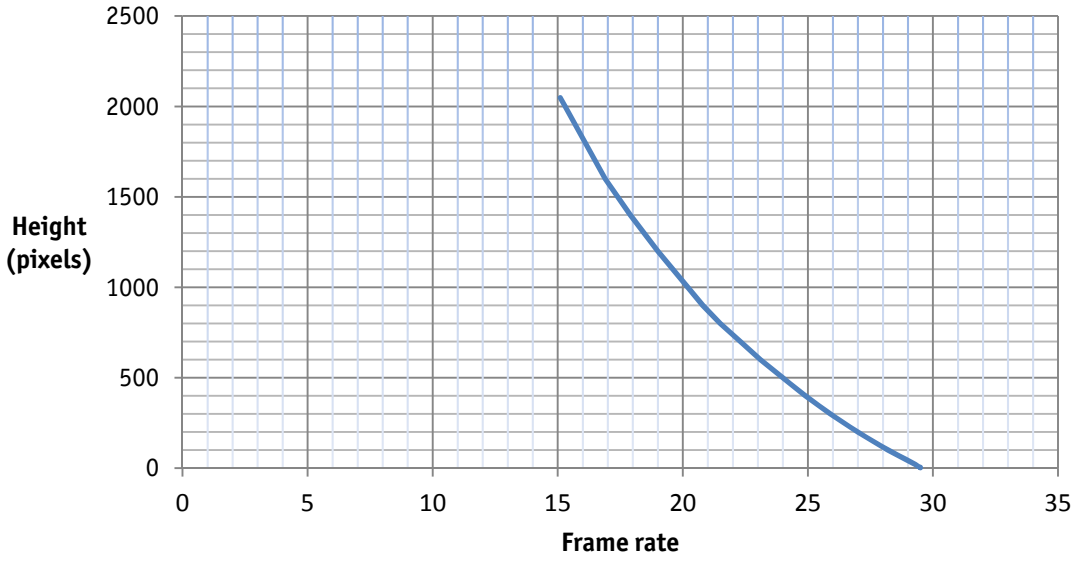


Figure 38: Maximum frame rate versus region height for GE2040

CAMERA: Prosilica GE4000

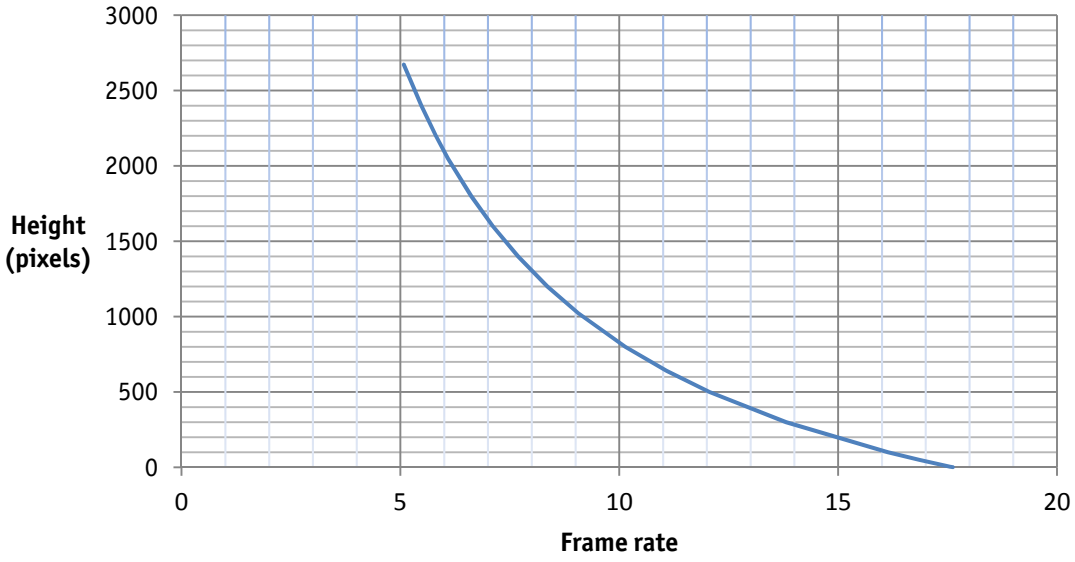


Figure 39: Maximum frame rate versus region height for GE4000

CAMERA: Prosilica GE4900

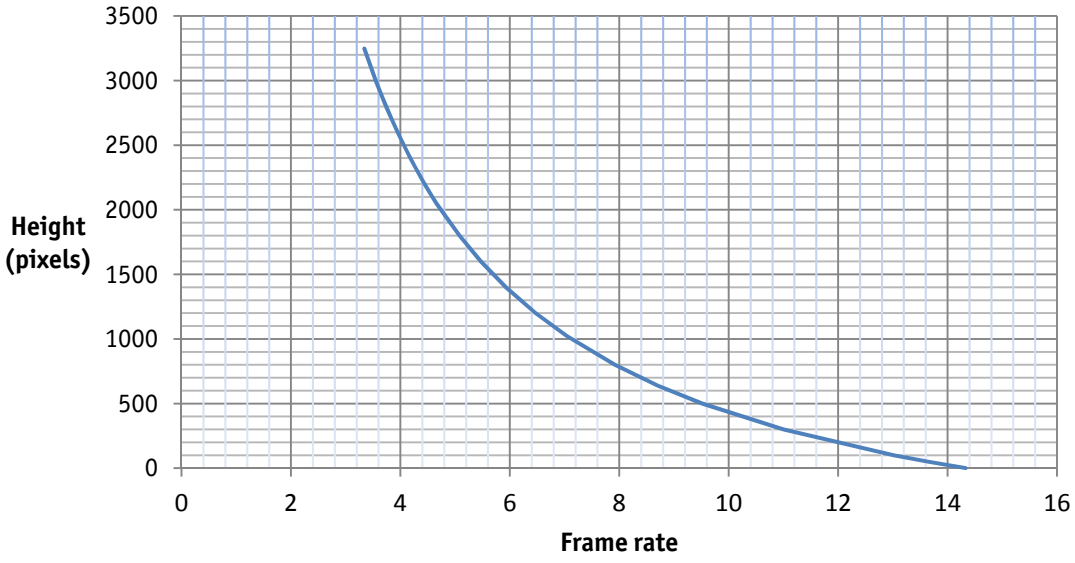


Figure 40: Maximum frame rate versus region height for GE4900

Prosilica GE frame rate performance comparison

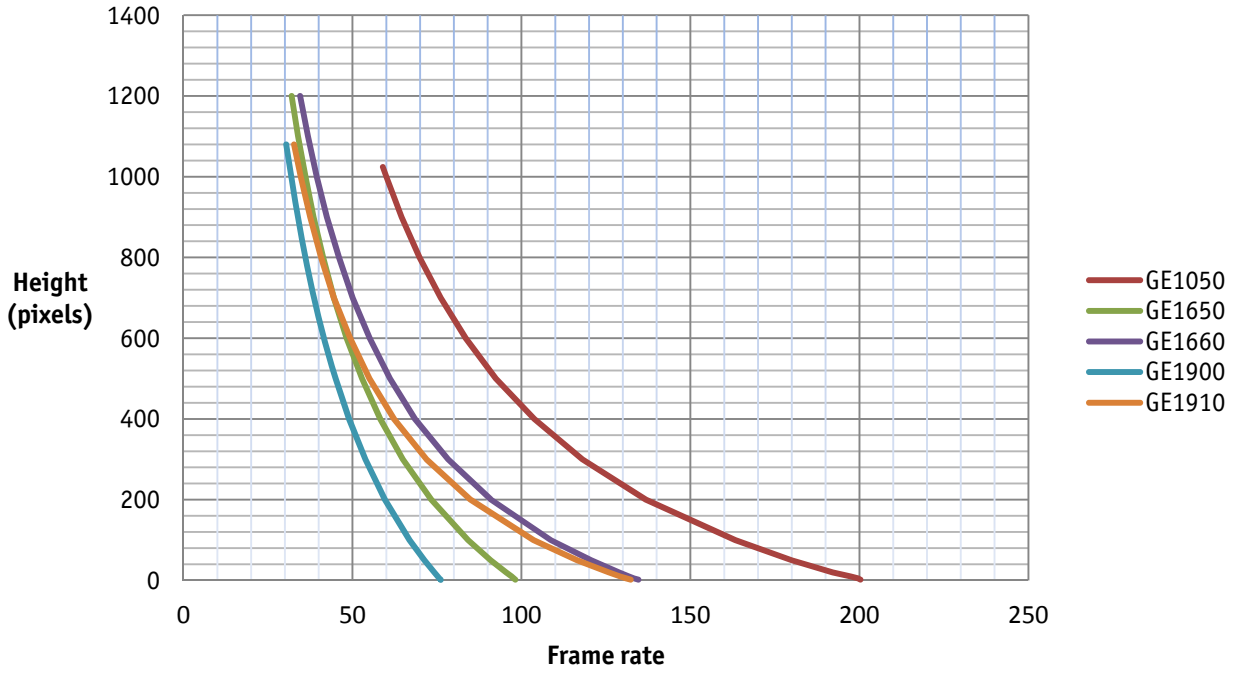


Figure 41: Maximum frame rate comparison for select models

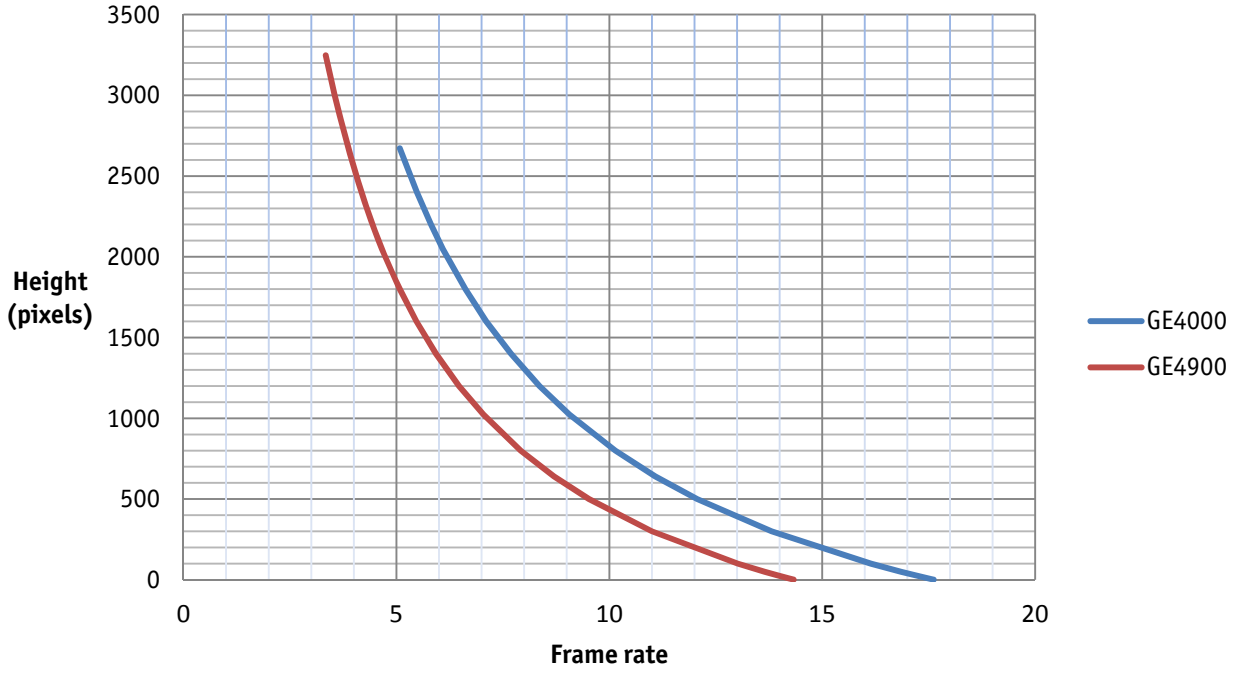


Figure 42: Maximum frame rate comparison for select models

Additional references

Prosilica GE webpage

http://www.alliedvisiontec.com/us/products/cameras/gigabit-ethernet/prosilica-ge.html

Prosilica GE Documentation

http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-ge.html

AVT GigE PvAPI SDK

http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

Knowledge Base

http://www.alliedvisiontec.com/us/support/knowledge-base.html

Case Studies

http://www.alliedvisiontec.com/us/products/applications.html

Prosilica GE Firmware

http://www.alliedvisiontec.com/us/support/downloads/firmware.html